THE

JOURNAL OF GAS LIGHTING,

WATER SUPPLY, & SANITARY IMPROVEMENT.

[REGISTERED AS A NEWSPAPER.]

VOL. XXIV. No. 589.] LONDON, AUGUST 25, 1874. [26TH YEAR.] Price 6d.

RAMSAY'S NEWCASTLE CANNEL
COAL. Analysis—16,000 cubic feet of gas per ton of coal; 26-candle gas; 13¼ cwt. coke per ton of coal.
The London Exhibition in 1851 was lighted with gas made from Ramsay's Cannel.
RAMSAY'S PATENT CONDENSED COKE.
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RAMSAY'S FIRE-CLAY ARTICLES.
GAS-RETORTS, introduced 1836. FIRE-BRICK WORKS, established 1804. FIRE-CLAY SANITARY PIPES, CHIMNEY-TOPS, and all Goods made of Fire-Clay. The Fire-Clay is worked from Blaydon Main Colliery, is of excellent quality, and no expense spared in perfecting every article. The FIRE-BRICKS (marked "RAMSAY") are to be seen in all parts of the world, and the Works are the most extensive in the Kingdom.
Manufactories—Derwenthaugh, Swalwell, and Hebburn Quay, near Newcastle-on-Tyne; and London Wharves—Falcon Wharf, No. 80, Bankside; and Honduras Wharf, Cubitt Town. Large stocks kept.
Address G. H. RAMSAY, NEWCASTLE-ON-TYNE.

GENUINE TORBAY PAINT
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SPECIAL GASOMETER PAINT
(Mixed ready for use).
FOUR PRIZE MEDALS.
WORKS: BRIXHAM, TORBAY.
These Paints are now used in 100 Country Gas-Works, and by all (but one) of the London Gas Companies, on Gasholders, Scrubbers, Purifiers, &c. They will cover tar effectually. Also used by the Admiralty, War Office, Railway Companies, Founders, &c.
They prevent and arrest rust, and protect iron from the action of water, sulphurous and gaseous exhalations.
The covering powers are considerably greater than those of any other Paint.—*See "Engineer," Nov.* 2, 1866.
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London Office, 21, Great Winchester Street, E.C.

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SPECIALITIES IN WOOD
FOR
PURIFIERS & SCRUBBERS
MADE FROM THE BEST QUALITY
OF
WELL-SEASONED PLANKS.
BROOKFIELD WORKS,
103, ICKNIELD STREET EAST,
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COWEN'S PATENT FIRE-CLAY RETORTS.
JOSEPH COWEN and CO.,
BLAYDON BURN, BLAYDON-ON-TYNE,
Were the only parties to whom a PRIZE MEDAL was awarded at the GREAT EXHIBITION of 1851, for "GAS-RETORTS and OTHER OBJECTS in FIRE-CLAY," and they were also awarded at the INTERNATIONAL EXHIBITION of 1862, the PRIZE MEDAL for "GAS-RETORTS, FIRE-BRICKS, &c., for EXCELLENCE of QUALITY."
J. C. and Co. have been for many years the most extensive Manufacturers of Fire-Clay Retorts and Fire-Bricks in the Kingdom. Orders for Fire-Clay Retorts of all shapes and dimensions, and to fit any shaped Mouthpiece, Fire-Bricks, and every other article in Fire-Clay, are promptly executed at their Works as above.
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JOHN RUSSELL AND CO.,
THE OLD TUBE-WORKS, WEDNESBURY
AND
THE ALMA WORKS, WALSALL.
Established at the commencement of Gas Lighting.
WAREHOUSES:
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COMMERCIAL STREET, SPITALFIELDS;
5, CHARLES STREET, SOHO; and
16, SOHO SQUARE, } LONDON
35, 36, 37, & 39, GRANBY ROW, MANCHESTER.
J. R. and Co. are the original manufacturers of Wrought-Iron Gas Tubes and Fittings, and Inventors of the LAP-WELDED TUBES for Locomotive and Marine Boilers.
J. R. and Co. make all kinds of Tubes and Fittings for Gas, Steam, and Water; Gun-Metal Cocks, Stocks, and Dies; Galvanized Tubes and High-Pressure Tubes, &c.
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ESTABLISHED 1830.

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MANUFACTURERS OF
TELESCOPIC & SINGLE GASHOLDERS,
CAST & WROUGHT IRON TANKS FOR DITTO,
And Gas Apparatus of every Description.
Marine, Tubular, Cornish, Plain, Furnace, Saddle, and Range Boilers.
SUGAR, SALTPETRE, AND ALL KINDS OF PANS.
Roofs, Girders, and Bridges, and General Smith's Work.
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SCOTTISH CANNEL COAL.
J. & W. ROMANS, Consulting Gas Engineers and Coal Factors, of Edinburgh and London, CONTRACT for supplying any quantity of COAL and CANNEL.
They are also Contractors for leasing Gas-Works, for supplying, erecting, or repairing gas apparatus and fire-clay goods.
Messrs. ROMANS, being lessees of several Gas-Works, have their Cannels tested in the ordinary working process, thus securing for their customers a guarantee beyond mere laboratory experiments.
Analysis, prices, and other information will be forwarded on application to their Offices, 8, Forth Street, EDINBURGH; 1, Walbrook, Mansion House, LONDON, or to the "Crown Wharf," Thomas Street, Limehouse, LONDON, where stocks of house, steam, and gas coal are always on hand.
Coal, machinery, fire goods, &c., shipped to all parts of the world.

THE
DUKE OF HAMILTON'S
LESMAHAGOW
CANNEL COAL.
AGENT:
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PATENTEES OF THE
NATIONAL STANDARD GASOMETERS
For the English Government, and for the Government of the Netherlands;
MAKERS OF THE DUPLICATE COPY
Presented by Her Majesty's Government to the French Government;
AND MANUFACTURERS OF
IMPROVED
DRY GAS-METERS,
Warranted to Measure correctly, and not to vary.
RANELAGH WORKS, RANELAGH ROAD, PIMLICO, LONDON, S.W.;
236, GEORGE STREET, GLASGOW; AND 15, MARKET STREET, MANCHESTER.

G. G. and Co. have just received the only Medal awarded for Gas-Meters at the Vienna International Exhibition.

SILVER MEDAL, PARIS EXHIBITION, 1867.

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ALBION TUBE-WORKS, BIRMINGHAM,

MANUFACTURERS OF

WROUGHT-IRON TUBES AND FITTINGS

AND

LAP-WELDED IRON AND HOMOGENEOUS METAL BOILER TUBES.

Boiler-Tube Ferrules, Gun-Metal Gland Cocks, Water-Gauges, Whistles, &c.; Stocks, Taps, and Dies for Screwing, and Gas-Fitters Tools.

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MANCHESTER: Barlow's Croft, Chapel Street, Salford.
PARIS: No. 38, Rue du Chateau d'Eau.
LILLE: No. 38, Rue Grande Chaussee.

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STOURBRIDGE,

MANUFACTURERS of FIRE-BRICKS, LUMPS, & TILES,

AND EVERY DESCRIPTION OF FIRE-CLAY GOODS.

N.B.—A Stock of 15 and 16 in. CIRCULAR RETORTS always on hand. Other kinds made to order on short Notice.

CAFFALL, THOMAS, & CO., LIMITED.

PATENT IMPROVED SEAL

FOR

GAS HYDRAULIC MAINS.

SAVES COAL, RETORTS, FUEL, LABOUR, TIME, SPACE, AND CAPITAL.

PREVENTS STOPPAGE OF ASCENSION-PIPES, DEPOSITION OF CARBON IN RETORTS, THICKENING OF TAR IN HYDRAULIC MAIN.

GIVES MORE GAS PER TON OF COAL, WITH HIGHER ILLUMINATING POWER, SATISFACTION, AND PROFIT TO SHAREHOLDERS AND MANAGERS.

IS STRONG, SIMPLE, EASILY FIXED AND WORKED, AND THOROUGHLY EFFICIENT AT ALL TIMES.

TESTIMONIAL.

Alton Gas and Coke Company, Alton, Hants, April 25, 1874.

GENTLEMEN,—In reply to your inquiry respecting your Patent Dip for Hydraulic Gas-Mains in use at these works, I beg to say that, upon looking into our carbonizing account for the last 12 weeks, and comparing the result with the same quarters of the past five years, I find that your Dip has given our Company an increase of 1286 feet of gas per ton of coals beyond the makes in the other years, notwithstanding the retorts have been in use for three years.

I may say that our Company are so satisfied with the Dips that it is intended to fit up the other retorts with them this summer.

I am, gentlemen, your obedient servant,

Messrs. Caffall, Thomas, and Co., Limited, 28, Gracechurch Street, E.C. WM. TRIMMING, Secretary.

Models may be seen, and information obtained, at the Offices, 28, Gracechurch Street.

TRADE MARK.

THE MEDAL FOR 1862.

The only Prize Medal awarded for TUBES & FITTINGS.

CROWN TUBE-WORKS,

WEDNESBURY, STAFFORDSHIRE.

WAREHOUSE: SOUTHWARK STREET, LONDON.

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PATENTEES & FIRST MAKERS OF WROUGHT-IRON TUBES,

ONLY MAKERS OF HOMOGENEOUS METAL TUBES.

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TUBES and FITTINGS for GAS, STEAM, and WATER;

LAP-WELDED, LOCOMOTIVE, MARINE, and other BOILER TUBES;

HYDRAULIC TUBES, BEDSTEAD TUBES, WELL TUBES, TELEGRAPH POSTS, COILS, &c.;

GAS-FITTERS TOOLS, VALVES, COCKS, &c.

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CAST & WROUGHT IRON TANKS FOR DITTO;

PURIFIERS, CONDENSERS, SCRUBBERS, RETORTS, VALVES;

IMPROVED WROUGHT-IRON RETORT-LIDS, CROSS-BARS, & SCREWS;

AND GAS APPARATUS OF EVERY DESCRIPTION.

SOLE MANUFACTURERS OF LIVESEY'S PATENT GASHOLDER MAN-LID,

By use of which Man-lid, inlet and outlet pipes can be examined and cleansed without loss of gas in crown of holder, or ingress of atmospheric air.

ROOFS, GIRDERS, BRIDGES, AND BOILERS OF ALL KINDS.

Drawings, Specifications, and Estimates supplied on application.

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HENRY HOWARD & CO.,

COOMBS WOOD PATENT TUBE-WORKS,

OLD HILL, near DUDLEY,

MANUFACTURERS OF

HOWARD'S PATENT IMPROVED WROUGHT-IRON TUBES,

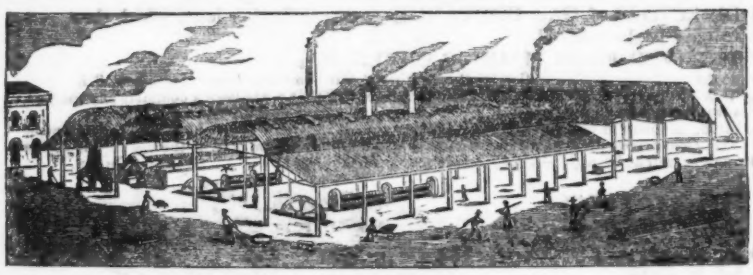
FOR GAS, STEAM, AND WATER;

Also ORDINARY WELDED WROUGHT-IRON TUBES and FITTINGS,

FOR GAS, STEAM, & WATER, EITHER BLACK, GALVANIZED, OR ENAMELLED.

CORE BARS FOR IRONFOUNDERS, STOCKS, TAPS, AND DIES, IRON COCKS, &c.

London Agent—W. G. DAVIS, 2, Brabant Court, Philpot Lane, E.C.



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MANUFACTURER OF

GALVANIZED CORRUGATED CURVED IRON ROOFING, WROUGHT-IRON FRAMED ROOFING, IRON BUILDINGS

OF EVERY KIND.

WROUGHT-IRON TANKS, WROUGHT-IRON PIPES & TROUGHS, & GENERAL WROUGHT IRON WORK.

I. D.'s CORRUGATED CURVED SELF-SUPPORTING IRON ROOFS are specially suitable for Forges, Rolling-Mills, Iron-Works, Shipbuilding Yards, Mines, Collieries, Gas and Water Works, and for general purposes.

For Roofs with Timber Framing, I. D.'S GALVANIZED OR PAINTED CORRUGATED SLATES OR SHEETS form a durable and cheap covering, costing only about the same, when fixed complete, as felt and boards.

DRAWINGS AND ESTIMATES ON APPLICATION.

HODGE & CO.'S

IMPROVED VENTILATING SUN-LIGHTS

WITH TALC REFLECTORS AND SELF-ACTING VALVES

TO PREVENT DOWN-DRAUGHT;

VENTILATING GLOBE LIGHTS for DINING-ROOMS, LIBRARIES, &c.

Ormolu, Bronze, & Crystal Gaseliers;

MEDIÆVAL CHURCH WORK AND CORONÆ

COCKS, VALVES, and FITTINGS for GAS, STEAM, and WATER;

COLUMNS, BRACKETS, & STREET LANTERNS;

BLACK AND GALVANIZED BARREL COMPO AND TIN PIPE.

GAS ENGINEERS,

100, HATTON GARDEN, LONDON.

Drawings and Prices upon application.

THE

LANCASHIRE GAS-METER COMPANY,

LIMITED,

FALCON STREET, OLDHAM.

INCORPORATED, JUNE, 1874. CAPITAL, £20,000.

We desire to inform our Friends, Gas Companies, Gas Engineers, and others that we are erecting Works at this address, and hope in a short time to have the pleasure of submitting our lists of apparatus to them, and to solicit their patronage.

HENRY THOMAS, Managing Director.

ALDER AND MACKAY,

GRANGE WORKS, EDINBURGH,

MANUFACTURERS OF

CONSUMERS IMPROVED GAS-METERS;

IMPROVED DRY GAS-METERS, in Cast Iron and Tin Cases,

OF THE HIGHEST EXCELLENCE,

Warranted to measure correctly, and not to vary.

STATION METERS AND GOVERNORS,

EXPERIMENTAL METERS, PHOTOMETERS, GASHOLDERS, &c.

JOHN WRIGHT AND CO., ESSEX WORKS, BIRMINGHAM,

Beg to call the attention of MANAGERS and DIRECTORS of GAS COMPANIES to the following letter which they have lately received.

COPY OF LETTER RECEIVED FROM MAGNUS OHREN, Esq.

To Messrs. John Wright and Co., Essex Works, Birmingham. *Crystal Palace District Gas Company, Lower Sydenham, S.E.*

Dear Sirs,—In reply to your inquiries, I am glad to state that the use of GAS COOKING AND HEATING STOVES has been a complete success here. We have several hundred in use in our districts. We also find it advantageous to let out Stoves at a small rental. We have now 275 Stoves at rent.

The Stoves you make I can with confidence recommend, having so many in use, and giving satisfaction. I need scarcely point out to you the advantage to Gas Companies to recommend the use of Gas Stoves to their Gas Consumers, even where they do not supply them on sale or rent, as the use of Gas Stoves brings day consumption, and thus the Company make a profit by day as well as by night.—I am, dear sirs, your faithfully, MAGNUS OHREN.

GAS COOKING STOVES

(PORCELAIN AND IRON).

REFLECTOR GAS

COOKING STOVES.

BREAKFAST COOKERS.

BATHS HEATED by GAS

GAS STOVES

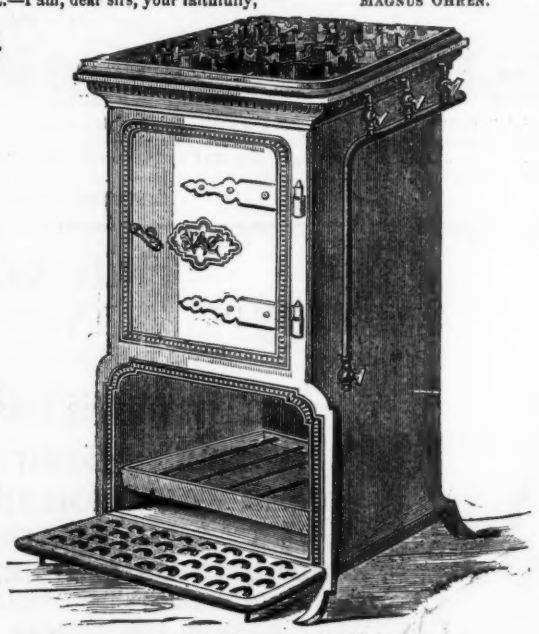
For Boiling, Broiling, Preserving, Heating Flat Irons, and for all other Domestic purposes.

Gas Companies and the Trade who have not our Illustrated Catalogue are respectfully requested to apply for same.

A LIBERAL DISCOUNT to the TRADE.

Size, 25½ in. high; 14 in. wide; 12½ in. back to front.

Price 50s., complete with Pan and Gridiron.

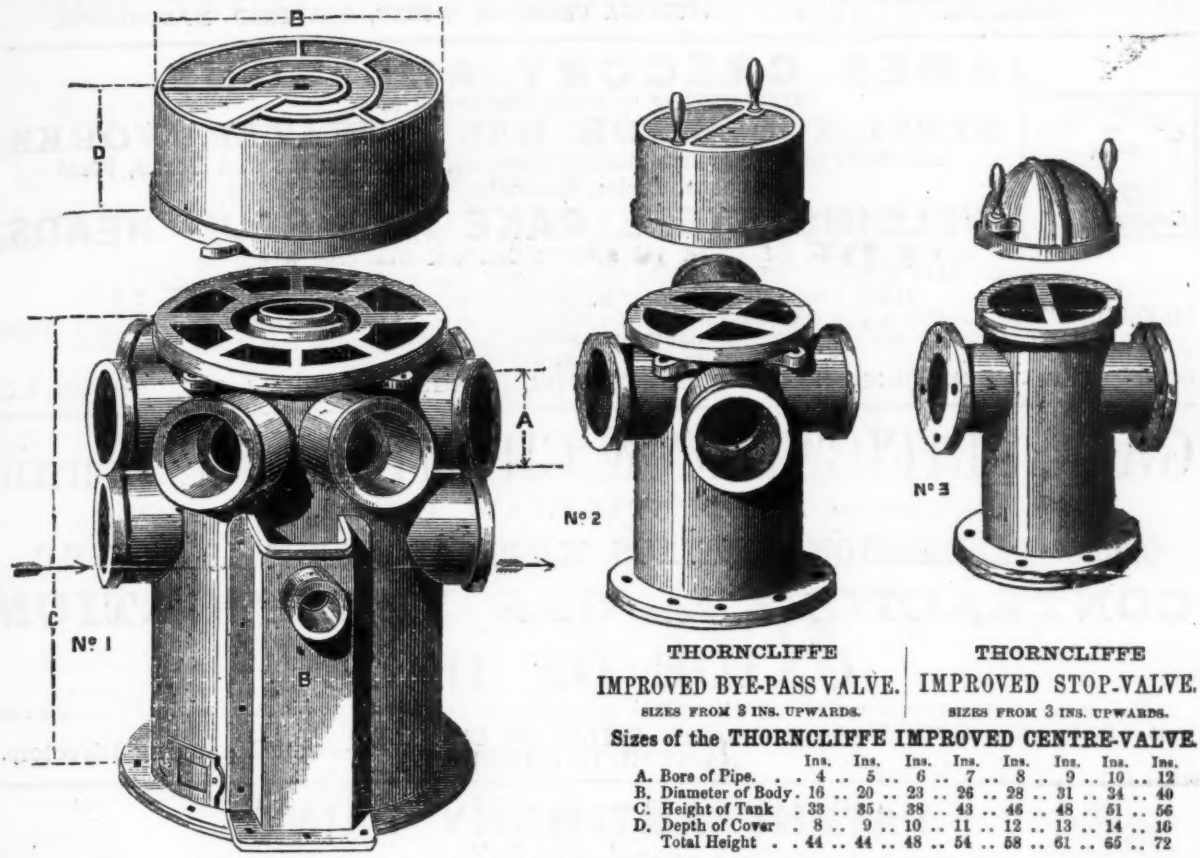


No. 56.—REFLECTOR GAS COOKER. Size, 36 in. high, 18 in. wide; Hot-Plate, 22 in. × 16 in., with 3 Burners for Boiling. In addition to the advantages of every other Reflecting Gas Cooker, the manufacturers claim the following:—1st, a larger Hot-Plate; 2nd, a larger oven; 3rd, a far better looking and better made article. Price £3.

MESSRS. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, NEAR SHEFFIELD.

IMPROVED CENTRE-VALVES.



THORNCLIFFE IMPROVED BYE-PASS VALVE. SIZES FROM 3 INS. UPWARDS.

THORNCLIFFE IMPROVED STOP-VALVE. SIZES FROM 3 INS. UPWARDS.

Sizes of the THORNCLIFFE IMPROVED CENTRE-VALVE.

	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.	Ins.
A. Bore of Pipe. . .	4 ..	5 ..	6 ..	7 ..	8 ..	9 ..	10 ..	12
B. Diameter of Body .	16 ..	20 ..	23 ..	26 ..	28 ..	31 ..	34 ..	40
C. Height of Tank .	33 ..	35 ..	38 ..	43 ..	46 ..	48 ..	51 ..	56
D. Depth of Cover .	8 ..	9 ..	10 ..	11 ..	12 ..	13 ..	14 ..	16
Total Height . .	44 ..	44 ..	48 ..	54 ..	58 ..	61 ..	65 ..	72

In all cases the Covers are cast heavy enough to resist any required pressure.

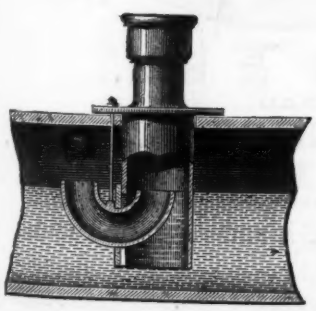
The advantages derived from the adoption of these Valves are so manifest and cardinal that in the immediate character of the change—the simplicity of the machine—the facility affording for cleaning out connexions between Valve and Purifier—the perfect collection and delivery by suitable overflow of the ammonia, at a greatly diminished depth from ground-line over the old form of Valve—the advantage of connecting on the same level, and at any angle, or opposite to each other, the inlet and outlet pipes without dip or rise—the clear acquisition of space in the purifying-house, by being able to place the boxes nearer together, the new Valve being entirely under the floor—and lastly, though of the greatest importance, the passage of crude and unpurified gas during the change is minimized to the merest fraction, thus preventing the fouling by impure gas the delicate machinery and easily affected exposed movements of the station-meter, thereby preventing the introduction of the enemy (unpurified gas) into the gasholder. Also a dead abutment is offered to all back pressure, imparting thereby to the gauges, governors, and hydraulic seals, a steadiness of action never realized with the once famous, but now fast becoming obsolete, Hydraulic Centre-Valve.

N., C., and Co. also Manufacture and Erect

PURIFIERS, CONDENSERS, SCRUBBERS, GASHOLDERS, ROOFS,

And every description of Gas Machinery.

TENDERS GIVEN FOR WORK FIXED COMPLETE IN ANY PART OF THE KINGDOM.



Messrs. N. C. & Co. are also the Sole Agents for

HAWKINS' PATENT SELF-ACTING DIP-PIPES.

These Patent Self-Acting Dip-Pipes are rapidly coming into general use by gas companies. By their use the whole of the pressure caused by the old kind of Dip-Pipes is entirely removed, therefore the yield of gas per ton of coal is considerably increased. They also act as a perfect safeguard against the deposit of carbon (or scurf) inside the retorts.

A saving of fuel is effected, and the wear and tear to the retorts greatly diminished.

They are also perfectly Self-Acting, they being regulated solely by the gas. They cannot get out of repair, and when once fixed, will last as long as the old kind, and can be easily adjusted should the hydraulic main sink; they can also be worked with advantage where there is no exhauster.

Testimonials can be had from Herbert Unwin, Esq., engineer of the Sheffield United Gaslight Company and the Penistone Gas Company. At both these companies works they have been in constant operation for several months. Further testimonials can be had on application to the Patentee, J. G. Hawkins, Effingham Street Gas-Works, Sheffield.

For Prices, &c., apply to

Messrs. NEWTON, CHAMBERS, & CO.,

THORNCLIFFE IRON-WORKS, near SHEFFIELD.

WALTER MABON & CO.,
Engineers,
ARDWICK IRON-WORKS,
FAIRFIELD STREET, MANCHESTER,
MANUFACTURERS OF
IRON TANKS, GASHOLDERS,
GAS APPARATUS,
PIPES, VALVES, IRON ROOFS,
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DESIGNS, SPECIFICATIONS, & ESTIMATES FURNISHED.

SPENCE BROS. CHEMICAL COMPANY, LIMITED,
MANUFACTURERS OF
SULPHATE OF AMMONIA, VITRIOL, PATENT DRY COPPERAS, &c.
PURCHASERS OF
SPENT OXIDE AND AMMONIACAL LIQUOR;
AND CONTRACTORS FOR THE
PURIFICATION OF COAL GAS.
ALL COMMUNICATIONS TO
VICTORIA CHEMICAL WORKS, BRADFORD, MANCHESTER.

JAMES GREGORY AND SONS,
MANUFACTURERS OF EVERY DESCRIPTION OF
Corporate Mark SOHO Granted 1763.
STEEL TOOLS FOR GAS & WATER WORKS.
All-Steel Charging and Stoking Shovels, Coke Screens and Forks, Steel Scoops, Picks, Mattocks, Axes, Trowels, &c.
WELDING STEEL RAKE AND SPUD HEADS.
SUPERIOR CAST-STEEL FILES and SAWS; Solid Cast-Steel Hand and Sledge Hammers.
BEST CAST STEEL for making Chisels, Turning Tools, Taps and Dies, Drills, Snaps, &c.
SINGLE AND DOUBLE SHEAR, Spring, Sheet, and Blister Steel.
SILVER STEEL for Rod-Chisels and Diamond-Points for Cutting Cast-Iron Pipes, and for other work requiring a Special Quality and Temper, and every other description of Steel and Tools as supplied to the largest London Gas Companies, Contractors, and Engineers.
SOHO STEEL-WORKS. SHEFFIELD, & 2, GRESHAM BUILDINGS, BASINGHALL ST., LONDON, E.C.

GAS PURIFICATION & CHEMICAL Co., LIMITED,
(Successors to JOHN WILLIAM O'NEILL & CO.,)
Offices—PALMERSTON BUILDINGS, OLD BROAD STREET, LONDON, E.C.,
CONTRACTORS FOR GAS PURIFICATION BY OXIDE OF IRON.
The superiority of the material supplied by this Company is generally recognized, and it is now in use in nearly all the London and most of the large Provincial Gas-Works.
JOHN WILLIAM O'NEILL, SAMUEL H. JOHNSON, } Joint Managing Directors.

1862.
PATENT ANTIMONY PAINT.
CLASS II.
MADE ONLY BY
GEORGE HALLETT & CO.,
296, ROTHERHITHE, LONDON, S.E.
1862 LONDINI HONORIS CAUSA

This Paint having been in general use over twelve years (especially in some of the principal Gas-Works), and proved itself the best light-coloured Paint produced for resisting the influence of vitiated atmospheres, it is important that its qualities should be more widely known.
It is not discoloured like white lead in a sulphuretted atmosphere, nor washed off like white zinc; and its light colour reflecting heat, produces much less expansion of gas in holders painted with it than with dark colours, besides rendering them much more sightly. Its specific gravity is so much below white lead that the same weight will cover one-third more surface, while it is equal in body; and its price being about the same (30s. per cwt.), it is actually one-third cheaper. From experience, its manufacture is greatly improved, and it is quite suitable for all purposes in which white lead is employed.
Reference is kindly permitted by the Engineers of the City of London, Commercial, London, and Surrey Consumers Gas Companies, who pronounce it the best Paint known for their purposes.

N.B.—Antimony Paint, COVERING SO MUCH MORE WORK, costs about 20s. per cwt., as compared with White Lead at 30s. per cwt.; a similar economy arises from its use in Steam and Gas Joints, for which purpose it is superior to White Lead.
SPECIAL DRIERS FOR ANTIMONY PAINT SUPPLIED.

Established

1795.

JOSEPH CLIFF & SON,
THE ORIGINAL
WORTLEY FIRE-BRICK WORKS,
NEAR LEEDS,
MANUFACTURERS OF ALL DESCRIPTIONS OF
FIRE GOODS, and Salt-Glazed Drain-Pipes.
LONDON WHARF:
Wharf No. 4, inside Great Northern Goods Station, King's Cross, N.;
LIVERPOOL—1, Back Leeds Street,
Where is always kept a Stock of Retorts, Fire-Bricks, Terra Cotta Ware, and Drain-Pipes.

TANGYE BROTHERS AND HOLMAN,

LAURENCE POUNTNEY LANE, LONDON, E.C.,

SOLE MAKERS OF

MORTON'S PATENT SELF-SEALING RETORT-LIDS,

WITH

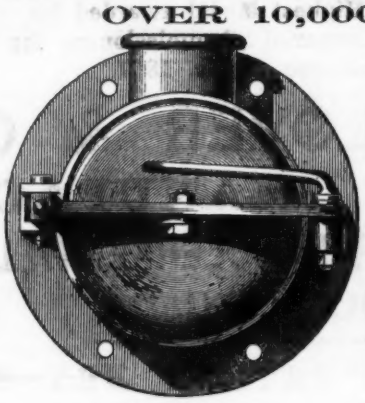
HOLMAN'S PATENT ECCENTRIC FASTENINGS & ANTI-FRICTION CATCHES.

OVER 10,000 IN USE.

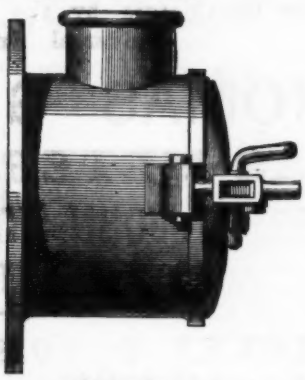
NO LUTING.

LIDS HINGED TO MOUTHPIECES; NO LIFTING ON OR OFF.

NO SCREWS FOR FASTENING.



FRONT VIEW.



SIDE VIEW.

SIMPLE.

ECONOMICAL.

DURABLE.

EFFECTIVE.

NO DUPLICATE LIDS REQUIRED.

These Lids are proved by many eminent Gas Engineers to be the most efficient, saving much time, labour, and expense; are opened and closed as quickly and with as little trouble as an ordinary furnace door, and by their use the Retorts are soundly sealed during the whole period of carbonization.

These Lids are Adopted by the following (among many other) Gas Companies:—

The Gaslight Company, Beckton (where over 2000 are in use).	The West Ham Gas Company.	The Salford Corporation Gas-Works.	The Carmarthen Gas-Works.
„ Gaslight Company, Bow Common.	„ Imperial Gaslight Company.	„ Rochdale Corporation Gas-Works.	„ Merthyr Tydfl. Gas-Works.
„ London Gaslight Company.	„ Gas-Works, Arsenal, Woolwich.	„ Liverpool United Gas-Works.	„ Ystrad Gas-Works.
„ Independent Gaslight Company.	„ Commercial Gas Company.	„ Birkenhead Gas-Works.	„ St. Alban's Gas-Works.
„ Phœnix Gaslight Company.	„ Alliance and Dublin Gas-Works.	„ Birmingham Gas-Works.	„ Over Darwen Gas-Works.
„ South Metropolitan Gaslight Co.	„ Edinburgh Gas-Works.	„ Nottingham Gas-Works.	„ Aylesbury Gas-Works.
	„ Manchester Corporatn. Gas-Works.	„ Newcastle-on-Tyne Gas-Works.	„ Cardiff Gas-Works.

The Morton's Lid is made circular in form, that being the most convenient and suitable shape. It can be used for Retorts of any section, by adapting the Mouthpiece casting from the D, oval, or other shape, at the back, to circular in front.

The following important Testimonial has been given:—

THE GASLIGHT AND COKE COMPANY

(Commonly called the Chartered Gas Company),

BECKTON, NORTH WOOLWICH, July 2, 1874.

MESSRS. TANGYE BROTHERS AND HOLMAN.

Gentlemen,—In answer to your inquiry respecting the Self-Sealing Lids, I beg to say that they continue to work well, and I have every reason to be satisfied with them.

I should be very sorry to return to the old system of Luting, and our stokers here freely acknowledge the benefit to them of the new system.

I am, yours truly,

(Signed) G. C. TREWBY.

P.S.—We shall have very shortly about 3000 of your Lids in use.

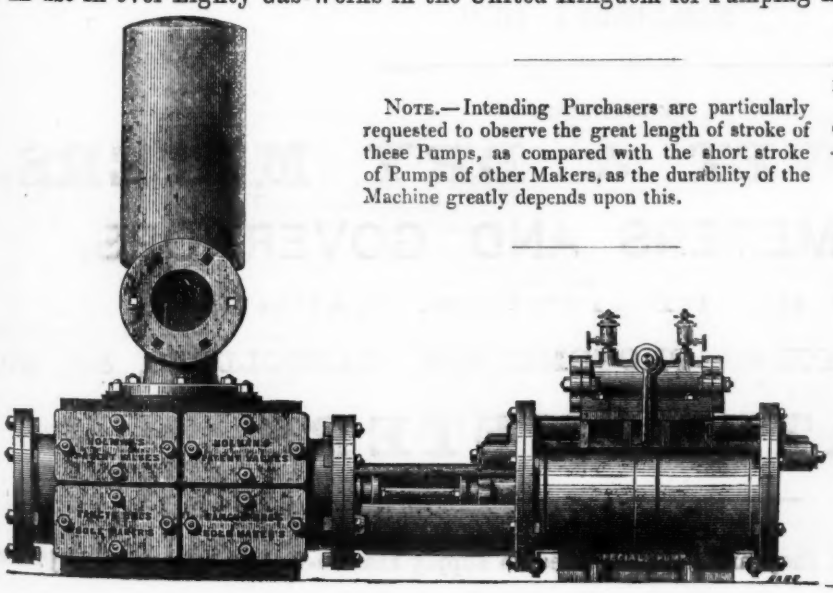
GREAT REDUCTION IN PRICES

OF

THE "SPECIAL" DIRECT-ACTING STEAM PUMPS.

Nearly 4000 have been sold since their introduction in 1867.

In use in over Eighty Gas-Works in the United Kingdom for Pumping Ammoniacal Liquor, Water, or Tar.



NOTE.—Intending Purchasers are particularly requested to observe the great length of stroke of these Pumps, as compared with the short stroke of Pumps of other Makers, as the durability of the Machine greatly depends upon this.

The following are a few of the leading Sizes:—

Diameter of Steam Cylinder.	Diameter of Water Cylinder.	Length of Stroke.	Gallons per Hour, Approximate.	Price.
3	1½	9	550	£16
4	2	9	970	18
3	3	9	2,200	18
4	3	12	2,200	20
6	3	12	2,200	25
4	4	12	3,900	25
6	4	12	3,900	30
6	5	12	6,100	35
7	5	12	6,100	40
8	5	12	6,100	45
6	6	12	8,800	40
8	6	12	8,800	50
7	7	12	11,900	50
10	7	12	11,900	65
8	8	18	15,660	65
10	8	18	15,660	75
10	9	24	19,800	90
12	9	24	19,800	110
10	10	24	24,400	100
14	10	24	24,400	140
12	12	24	35,240	140
21	12	36	35,240	285
14	14	24	47,960	180
26	14	48	47,960	450

London 1851. New York, 1853. Paris, 1855. London, 1862.

Dublin, 1865.

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PATENT DRY GAS-METERS,

The latter being the Highest Medal awarded for Dry Gas-Meters by the Imperial Commissioners for the Universal Exhibition, Paris, 1867.

Paris, 1867.

THOMAS GLOVER & CO.,

DRY GAS-METER MANUFACTURERS,

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THOMAS GLOVER & CO.'S PATENT DRY GAS-METERS,

1st, Are a remedy for all the defects of Wet Meters;
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3rd, Incur no loss of Gas by evaporation;
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5th, Are the most accurate and unvarying measurers of Gas;
6th, Prevent jumping or unexpected extinction of the Lights;
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Are upheld for five years without charge.

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Established 1816.

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W. P. & Co. beg to state that they are now prepared to supply Station-Meters with planed joints.

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No notice can be taken of anonymous communications. Whatever is intended for insertion, must be authenticated by the name and address of the writer; not necessarily for publication, but as a guarantee of good faith.

THE JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, AUGUST 25, 1874.

Circular to Gas Companies.

A case of considerable importance to several metropolitan gas companies, and which presents matter for serious consideration to many others, has been disposed of in the past week. The simple facts are these. A customer of the Surrey Consumers Gas Company had made a deposit by way of security to the amount of £4. He seems to have taken it into his head that, as the company charge meter-rent, he is entitled to have his money back, and he accordingly applied to the company to return it. This they, of course, refused to do, and he then summoned the company for the interest accrued at the rate of 5 per cent. per annum, which amounted to 14s. Under the 16th section of the Metropolis Gas Act, 1860, the rate of interest on deposits is to be fixed by the magistrate, and the case was down for hearing at the Southwark Police Court. Before it came on, however, the company paid the money demanded and the cost of the summons, and promised that interest should be allowed in future. Now, it appears to us that the section of the Metropolis Gas Act just quoted offers to a gas company two modes of obtaining security—of course at the option of the magistrate, if the case should be taken before one. The first mode is "the prepayment of a sum of money to the gas "company"—say the payment of an estimated quarter's rental in advance; the second mode is "the deposit with the gas company of "a sum of money." In the first case it seems clear to us that the consumer would not be entitled to interest; in the second, he obviously and clearly is, and the Surrey Consumers Company have acknowledged the validity of the claim. The concession appears to us to have some importance. Waiving for the moment the quibble stated above, let us consider first the rate of interest—5 per cent. per annum. This rate has been accepted in many recently passed special Acts. It is as much as is obtained on fully paid shares in freehold land societies—more than is paid on subscribing shares in such societies. An universal exaction of security would convert a gas company into a co-operative concern, if the amount obtained furnished sufficient trading capital. As it is, a consumer, instead of grumbling, might look with much satisfaction on his deposit, and, in some instances, the shareholders would be the parties to complain. If we suppose non-dividend paying companies like the Colchester, or, say, the Barnet District Company, to have deposits at interest on hand, it is clear that the business of those companies would have been carried on for the benefit of the consumers who have given security, rather than the shareholders. The former are, in fact, as well off as debenture holders. There is another question which we shall not now enter upon, and that is whether the consumer does not pay his own interest as well as that on the shareholders capital. The practical point—not for the metropolitan companies, with whom the deposits are utterly insignificant in relation to capital, but for many country companies, who are now bound to pay 5 per cent. on deposits—is that they should keep such deposits at a minimum, or even neglect them altogether, at the risk of making some bad debts, or raise them to the highest possible figure. It is easy to see that a company with whom every consumer had a deposit at 5 per cent. would be, in great part, a consumers company.

The Chartered Company have, with commendable energy and foresight, been busy in connecting their several works with large mains. In the course of this work it has been found advisable to carry the pipes through the London Company's district. In general the vestries concerned have freely given their consent to this; but, unfortunately, a portion of the London Company's district lies within the parish of St. George's, Hanover Square, and on application being made to the vestry of this parish they have flatly refused the company permission to take up the streets. When the metropolis was districted, amalgamation was not contemplated, or power would have been given in the Act of 1860 for the companies freely to communicate. As it is, what has been achieved by the St. George's Vestry? Work designed for purely economical purposes has been suspended. If the objection be persevered in, a considerable amount of capital will have been wasted. The company may, by making a long detour, avoid the parish of St. George's; but in this case there will be an outlay of capital entirely unnecessary. And yet these people complain of the wasteful expenditure of capital by gas companies. It is to us a small matter of gratification that the vestry of St. George's will pay their quota towards the interest on this wasted money. A short Act of Parliament, if it should be necessary, will next year set the matter to rights, but for this the unfortunate gas consumers will eventually have to pay. We notice a complaint in some quarters that the wealthy classes in the metropolis do not support the gas agitation. It may also be said that they do not interest themselves in vestry matters. The parish of St. George's, Hanover Square, is so rich that it can afford to allow the vestry to do their worst—and they do it.

The Town Council of Birmingham have begun to economize the use of gas in a rather curious way. The pressure is taken off the mains, it is reported, at 1.30 a.m., and from that time to sunrise the city and suburbs are practically in darkness. They might economize further, and have no night police, thus reducing the number of the force. Birmingham is not as yet a model town in point of morality. A special committee of the Town Council have had recently to take into consideration the alarming increase in crimes of violence. They might remember that a certain number of gas lamps are equal in moral force to one policeman. It would, in fact, be difficult to say which had done most for public morals—gas or police. In either case, the Town Council of Birmingham are ridiculously in the wrong. The paltry saving in the lighting, rate which will be effected by the change is beneath the notice of a wealthy community like that of the city.

Pontefract is just now in darkness, in consequence of a disagreement between the Town Council and the gas company, not as regards the price of gas, but as regards the rental to be paid for pillars and lamps. The dispute is to go to arbitration, under the Gas-Works Clauses Act, and therefore we are precluded from giving advice to either party. This much, however, we may say, that the rental for pillars and lamps should never exceed what we may call a life assurance, with a reasonable allowance for contingencies and interest on capital.

The Mayor of Ryde has issued a circular to the ratepayers asking an answer to several questions, one of which is, "Are you "willing that an Act of Parliament should be passed, at the "expense of the ratepayers, for the purpose of charging the rates

"of the town with the expenses of the gas arbitration remaining "unpaid—say £2000?" A very bad Frenchman has said that there never was such a thing as a grateful woman. We are certain that there never existed a grateful ratepayer, so we anticipate that the answer to the foregoing question will be an emphatic "No!" The members of the Corporation will then have to get out of the mess as they best can, and we may frankly say that we do not pity them. When men repudiate bargains, they must put up with the consequences.

It is well sometimes to see ourselves as others see us, and for that reason we quote the following paragraph from the *Philadelphia Ledger*, a paper occupying much the same position in the States as the *Economist* in this country. The writer is referring to an account of the Imperial revision case, which he finds in a London paper, and after describing the proceedings, and mentioning the advance of price granted, he goes on as follows:—

When it is remembered that, in addition to this elaborate machinery, which must be put in operation to secure an advance of a quarter of a dollar or less in the price of gas, there is a law completely regulating the standard of the light itself and all the details of its preparation, distribution, and payment, it will be seen that the consumers in London are better protected than in cities which boast of their self-government. An Act of Parliament, passed in 1871, prescribes in great detail the conditions binding both the gas producers and the gas consumers, who, by the way, in addition to the price of gas, pay rent for the meter, which is let by the company; the illuminating power of the gas is strictly regulated, and the tests are to be applied by a paid and impartial expert, who is to be appointed either by the municipal government or by competent local judicial authority; the purity of the gas is also to be tested, and the penalties—up to twenty pounds—can be enforced as well for a violation of the law in this as in other particulars. Under such regulations it is not surprising that the London gas companies supply their customers with good and cheap gas and manage their business with due care. Perhaps the English system may err on the side of too much caution, but that is no shortcoming in our own Philadelphia Gas-Works or the management of corporations throughout the country.

We are glad to see that the Cambridge University and Town Gaslight Company are able to pay a dividend for the past half year at the rate of 7 per cent. per annum. The learned chairman spoke to the meeting in hopeful terms; but took care to urge the Gas and Water Companies Association to take action in the next session of Parliament.

It is reported that an attempt will be made to fasten the responsibility of the partial destruction of the Liverpool landing-stage on the United Gas Company. The company were at the time making some repairs under the stage, in which work it is said plumbers were engaged, and by some means or other the gas became ignited. We must wait for the full investigation which will now take place, and while sympathizing with the Harbour Board, hope the best for the company.

The Ratcliff Company, we are sorry to see, will have to make another draw on their reserve-fund in order to pay a full dividend for the past half year.

We give to-day, by the favour of Mr. Wyatt, the first of a series of drawings illustrating the construction of a tank and holder now in course of erection by the Newcastle and Gateshead Gas Company. The designs attracted much attention at the recent meeting of the Gas Managers Association, and our readers, we are sure, will fully appreciate the kindness of Mr. Wyatt in allowing their publication.

The Barnet District Gas and Water Company are, we regret to see, not in the position to pay a dividend for the past half year. The net profit of the water undertaking appears to have been £7 16s., and of the gas undertaking, £635 16s. 11d.; and after paying interest on loans and mortgages, there is only left a balance available for dividend of £61 1s. 5d. We notice that the receipts for residuals during the half year are just about 25 per cent. of the expenditure for coal—a fact which we hope will remain in the minds of some. No doubt the works left by the Patent Gas Company necessitated a heavy expenditure of fuel, and their alteration has involved the company in extraordinary expenses.

Water and Sanitary Notes.

We publish, in another place, an excellent and impartial report by the Gas and Water Committee of the Corporation of London, on the water supply of the City. With the exception of a small area in the east, supplied by the East London Company, the whole water supply of the City is furnished by the New River Company. Everybody knows how admirably the affairs of that great company are managed; but some may be surprised to learn the perfection of the arrangements for the supply of the City; and, if the extreme liberality of the company were not also well known, we might be astonished to learn that the company have, *at their own expense*, fixed more than 2100 fire-boxes and plugs within the City (double the number required by statute), the outlay for which should have been borne by the local authorities. The question now relates to hydrants, and the company offer to give such a mileage of mains, under constant pressure, as would ensure to every house in the City one at least of these hydrants within a distance of 50 yards of its street front. But who is to bear the expense of the hydrants? The Common Council appear to think that the Metropolitan Board of Works ought to. Whether that body will consent to do so or not, we shall learn after the recess. In the meantime we are pleased to get the testimony of the Committee of the Common Council to the efficiency of the supply furnished by, and the extreme liberality of, the New River Company.

The water reports from different parts of the country are this week more favourable. A large addition has been made to the store in the Dundee reservoirs, and it is hoped that the full supply will soon be re-established. Great complaints having been made of the quality of the water from one of the sources of the Warrington Water-Works Company, that supply has been cut off for domestic purposes, and the water for Warrington now comes exclusively from the company's deep wells at Winwick. At Huntingdon there seems to be a difference of opinion as to whether water-works should be constructed by a private company or the Town Council. A thinly-attended meeting seems to have decided that the work ought to be undertaken by the Corporation, at which resolution some councillors seem to be astonished. The council, however, accept the situation, and resolve to get the work done as cheaply as possible.

The Town Council of Warwick have under consideration a scheme for an improved supply of water. At present they take their supply from the Avon, after that river has received the sewage of Coventry and other places. There is a bare trace of sewage matter in the water when it reaches Warwick, so rapidly is organic matter oxidized in a stream like the Avon. The Haseley scheme, proposed by Mr. Pritchard, it is calculated will furnish a daily supply of 214,927 gallons, which is none too much for the present population of Warwick. It is reported that some progress has been made by the Truro Town Council in the efforts to provide water, but how much it is difficult to say. They have begun to sink a well, and hope for the best; and the friends of the council state that only a trifle of money has been spent, *as yet*. The Town Council of Chesterfield are extremely selfish. The gas and water company are anxious to give a supply of water to some outlying places within their district; but the Town Council remonstrate, urging that the needs of Chesterfield should be the first and only consideration; and although they have the assurance of Mr. Hawksley that the company have four times the quantity of water necessary for the whole district, still the council do not appear to be satisfied.

The sewage difficulty at Nuneaton, to which we referred last week, appears to be the result of a very imperfect treatment of the sewage by the General Sewage Manure Company. It seems that the sewage is only treated for 12 hours out of 72, so that 60 hours of unpurified sewage passes into the river Anker. The Local Board are, of course, in correspondence with the company; in the meantime, Chancery proceedings are imminent.

Sir John Arnott proposes to relieve the Corporation of Dublin of all their difficulties about the purification of the Liffey, by undertaking to have the work done at his own expense. No city in the world is so indebted to the munificence of private citizens as Dublin—witness the doings of Guinness, of Dargle, and now Sir John Arnott. In time, perhaps, the people of Dublin may be induced to believe that more is to be got by enterprise and the steady pursuit of industry than by incessant political agitation.

A curious gathering assembled at Mr. Hope's sewage farm at Romford the other day. What the specific object of the meeting was it is difficult to say, unless it was to abuse the Metropolitan Board of Works. Mr. David Chadwick, C.B., and Mr. Rawlinson, C.B., were both there; so, although the reports of what was said are very imperfect, we may be certain that the criticisms on the Metropolitan Board were unsparing. Mr. Rawlinson appears to have indulged in the most severe remarks. He is a responsible officer of the Local Government Board, and we say with regret that we never saw a gentleman in his circumstances place himself in such an utterly false position as Mr. Rawlinson is reported to have done on this occasion. We sincerely hope that Mr. Sclater-Booth will give his attention to this matter, and require some explanation. It is intolerable that a Government officer should stand up to drive, if he could, the Metropolitan Board to the useless expenditure of a vast sum of the ratepayers money, or to, by implication, countenance the raising of two or three millions in the City, which, in the result, would beggar thousands.

LIGHTING TRAM CARS WITH GAS.—On the line of the London Street Tramways Company at Camden Town an experiment has been made in this direction. Underneath the car is fitted a receiving cylinder furnished with a valve connected with a lever hinged at one end near the orifice, through which the gas finds its inlet, and attached at the other to the centre of an india-rubber diaphragm, the whole being contained within a suitable air-tight casing, from which the gas is conveyed to the burners in the usual manner. This valve acts automatically, and lets the gas flow through in a perfectly uniform current, regulated to a pressure of 4-10ths of an inch of water.

A TREATISE ON THE SCIENCE AND PRACTICE OF THE MANUFACTURE AND DISTRIBUTION OF COAL GAS.

XXVII.

Retort-Settings.

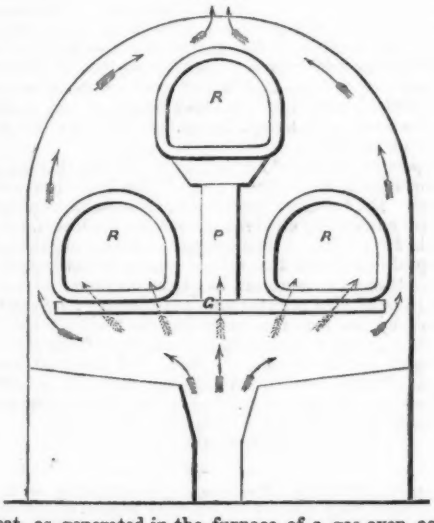
The settings, or beds, of retorts are of two kinds, one called the "single," a term alike applying to the retort as to the setting. This consists of a certain number of retorts, each, as generally used, varying in length from 7 feet to 9 feet, and placed within an oven, of which the end is closed by a wall made of considerable thickness, in order to prevent undue radiation of heat at that point. In small works these settings are placed side by side, extending the length of the retort-house; but, in larger establishments, they are set back to back, thus forming a continuous arch, divided by a wall in the centre, as represented in the drawing of Clegg's settings in longitudinal section, fig. 3, page 121. These are usually employed in all medium-sized works, and are called "double benches."

Prior to 1849, single settings were exclusively used; but, about that period, amongst other innovations introduced into the manufacture of gas, was the omission of the division wall in the centre, so that two single arches were converted into a "through" arch, and the retorts, instead of being, as formerly, 8 or 9 feet, were made 18 or 20 feet long, with two mouthpieces, and called "through" retorts, these being placed in their corresponding arches or ovens. Thus the retorts and settings are either "single" or "through," as described.

The advantages derived from the introduction of the latter system were, the gain of the space previously occupied by the division wall, while, by the absence of so much non-conducting material, the two furnaces assisted each other and promoted economy of fuel. Further, it is considered that in this method the deposit of carbon on the retorts is removed in some degree by the passage of atmospheric air therethrough. However, these settings cannot be adopted in works of limited capacity, for, as the two ends are required to be worked simultaneously, double the number of men are necessary for the purposes of charging and drawing, as well as for barrowing or spreading the coke, so that less than eight men cannot work them.

Some idea of the various modes of setting retorts, and conducting the heat around them, has already been given, when describing the earliest operations in this branch of gas manufacture. We now propose to describe the various methods adopted by different engineers in constructing retort-settings, and applying the caloric for the purpose of carbonizing. With the view of explaining this in the simplest manner, a few ordinary diagrams will, in the first place, be sufficient for the purpose; these will be followed, from time to time, by working drawings of various kinds of retort-settings, as found in operation at different gas-works.

FIG. 1



The heat, as generated in the furnace of a gas-oven, acts in two distinct methods—in one it is conducted directly from the fuel to the retorts, as shown by the dotted arrows in fig. 1; in the other the caloric is conveyed by the draught or current, as indicated by the arrows in all the accompanying engravings, and in its passage is absorbed by the material with which it comes in contact. Thus the heat may be said to be applied directly and indirectly—the first, by direct conduction, which is constant, according to the heat of the fuel; in the latter, the caloric is conveyed by the draught or current, which is considerably diminished in intensity during its passage, and if continued beyond certain limits, having a negative effect, as frequently experienced. In the figure referred to, or in any setting where the caloric passes directly to the flue, every facility should be given for the radiating heat to penetrate to the interior of the retorts, and with this object guard tiles should only be placed immediately over the furnace, the rest of the lower retorts, so far as practicable, being exposed to the direct action of the heat, due care being exercised to place slabs between the lower retorts along their whole length, so that the heat is forced to pass through the transverse channels, and thus escape at the sides of the retorts as shown.

It has been shown that even in the early years of gas lighting the importance of the current of caloric and the means of conveying it were well understood, as shown in fig. 7, page 43, where it was caused to pass under the retort nearly its entire length, and afterwards to pass over its top, and so off by an orifice to the flue. The same principle is now almost universally adopted, but on a much more extensive scale, and, as will be hereafter shown, in some cases our engineers rely more on the current of caloric than on that on the direct conduction by radiation.

FIG. 2

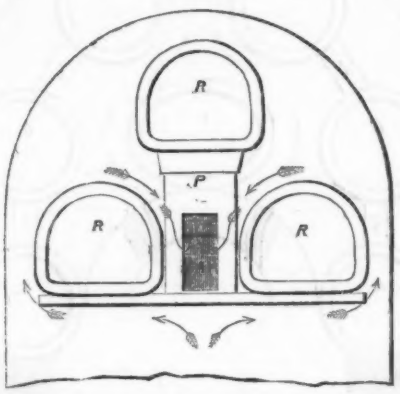
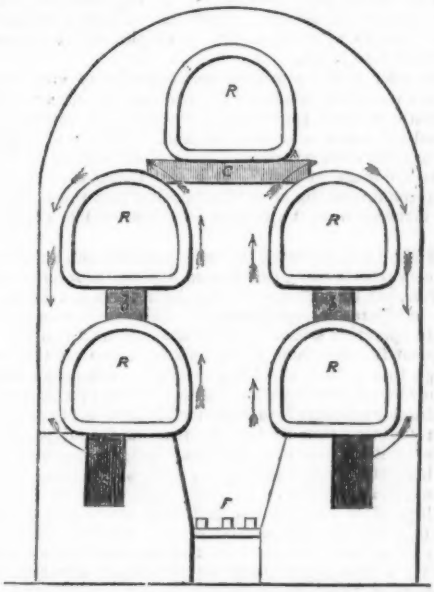


Fig. 2 shows the simplest means of causing the heat to make a circuitous course. In this instance, instead of passing direct to the flue, as in the former case, it is caused to pass over the tops of the lower retorts and descend into the flue running into the vertical flue, which is provided with a damper. Sometimes settings of three and five retorts are constructed on this plan, but whether it possesses any advantage over the preceding is a matter of doubt.

A simple means of conveying the heat direct from the fuel to the retorts without the intervention of any substance is shown in fig. 3, advantage being also taken of the current of caloric. Although only five retorts are represented, the principle is applicable to seven, and even nine retorts, as will be hereafter pointed out.

FIG. 3



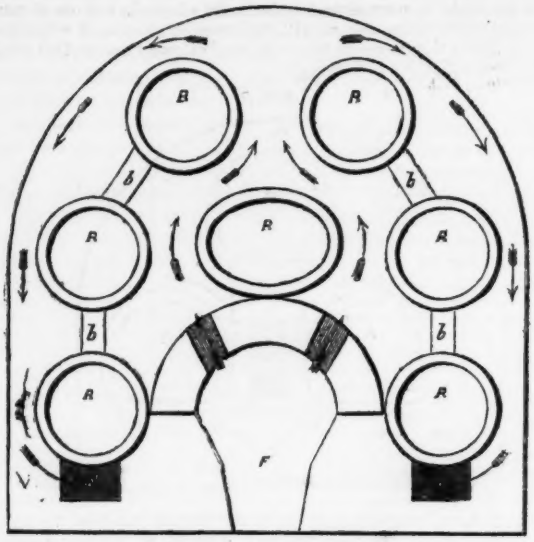
The lower retorts are each supported by piers, between which passes a flue communicating with the main flue, having its mouth within a few inches of the front wall. The walls, *b b*, supporting the second tier of retorts, extend the whole length of the bed, and prevent the current of heated air passing otherwise than by the orifice hereafter mentioned. The slabs, *c*, supporting the top retorts, also extend from the front to within 12 inches of the end wall, leaving an orifice there for the heated air to pass. Thus the caloric, as generated, is conducted to the retorts, and proceeding along the setting, passes off at the orifice at the end of the slabs, descends, continuing to the front of the setting, where it enters the flues, A A. This plan of employing the heat direct, and the current of caloric, is assuredly one of the most advantageous methods of setting retorts.

The accompanying figure (fig. 4) represents a system of setting retorts, which is applied in many large establishments. According to this method, the direct conduction of the heat appears to be a secondary consideration, inasmuch as thick arches are built directly over the furnaces, while the caloric is caused to pass through nostrils of defined, and often limited, capacity, and is thence frequently conducted through tortuous channels before entering the flue.

As shown in this diagram, there are four partitions, marked *b b b b*, continued along the whole length of the retorts, so that the caloric, in its course, can only pass through the space between the two upper

retorts, over which it is carried, and descends to flues A A, as shown by arrows.

FIG. 4



Another method, but one that is seldom employed, is to construct a thin transverse wall within the oven, having an opening at its top, dividing it into two compartments. The heat passing from the furnace, and through the orifice in the partition, descends to the flue at the lower part of the setting, and so off to the main flue.

Thus there are four different principles applied in the ordinary setting of retorts—the first, in which they are heated by conduction from the furnace, and the current of caloric passing over the retorts direct to flue; the second differs from the former, inasmuch as the current passes over the retorts into a flue within the oven; according to the third principle, the heat is conducted without any intervening body direct to the retorts; and, in the fourth, the current of caloric is made the principal source of heat. Of the advantages of these several principles the reader will hereafter be enabled to judge.

We now refer to the combined settings of clay and iron retorts. This system was first patented by Lowe and Kirkham in 1840, and, as they state in their specification, "the upper retorts are made of clay and the lower ones made of iron. By this arrangement, at those parts of the oven where the greatest heat will be found to exist, the retorts are made of clay." It is surprising that the patentees could have committed the error of supposing that the retorts farthest from the furnaces were the hottest—an error which was fatal to the system.

In 1843 Mr. Croll patented the same combination, but properly applied, the clay retorts being first heated, and the caloric then passing to those of iron; but by preference "the clay retorts and the iron retorts should be in separate compartments." This patent was carried practically into operation a short time afterwards, as already mentioned, its subsequent failure arising solely from the nature of the retorts.

Although this method of setting retorts has not been received with much favour by engineers, we are convinced, from practical experience, that considerable economy is to be derived from it; but to ensure success, more than ordinary care in the construction is indispensable. The arguments in its favour are, that clay being a powerful non-conductor of heat (the relative conducting powers, according to Despretz, being—iron, 374; fire-clay, 11·4), the heat which is not absorbed by the clay, after leaving the bed and passing into another of iron retorts, could be made available, and would be sufficient to heat the latter. The fact, however, is, that frequently clay retorts are worked with a heat approaching bright orange, about 2200° Fahr., and the waste of two beds so heated, say of five retorts each, when conveyed into another setting of five retorts, of course unprovided with a furnace, will be sufficient to maintain them at a temperature approaching bright cherry red. For this purpose little extra fuel would be required, and consequently the coal in the iron retorts would be carbonized at a nominal cost. A peculiarity in this system is that the iron retorts, although in an oven detached from the clay retorts, become visibly heated long before the latter show any signs of heat. The principle of combined settings has been strongly supported by Mr. George Anderson, who, during many years, has extensively applied them, and the economy of fuel effected thereby, as described by him, is remarkable. From our personal experience, on a limited scale, we believe that wherever the retorts are properly set, considerable profit must arise from this system. In due time one or more drawings of combined settings will be presented.

It has often been a subject of remark that gas-works of the first magnitude do not show any degree of superiority in their operations over those of medium capacity, having, say, a production of one million cubic feet per annum, and above. It is true that in some respects the smallest works are placed on an equal footing with the largest, as the former can obtain the same quantity of gas, of the same illuminating power, and the same quantity of coke from a ton of coal, as the latter. But in the principal economy, the fuel for carbonizing, there is a wide difference in their operations, inasmuch as works of the smallest capacity employ all the coke they produce as fuel, and as they increase in size, so do the returns from the sales of this and other residuals proportionately augment. It appears, however, that after attaining a certain magnitude, this advantage ceases, and we are not far wrong in asserting that the consumption of coke for fuel in large works averages 23 per cent. of the production, whereas we know that there are many medium-sized works where the amount is certainly less than this, showing an advantage in the latter which can only consist in the superiority of the settings of retorts employed by them.

When speaking of the materials necessary for the construction of retort-settings, it should have been observed that the arches of the ovens are generally constructed of Newcastle fire-bricks, which are well adapted for the purpose, but only those of the best kind should be used. An arch properly built with these will last from 12 to 14 years; all that is required in the meantime, when resetting retorts, being to plaster up with fire-clay any crevices that may exist. It may be further remarked that for common brickwork, when in the immediate vicinity of strong heat, mortar should not be employed, as it never crystallizes, but crumbles; sometimes falling through crevices in the setting, and acting as a flux on the bricks of the oven. A mixture of sand and clay, well worked together until suitable for the trowel, should always be used.

A rule to be observed in constructing settings is to make the ovens sufficiently large for the retorts, but to avoid any excess.

Formerly, in setting iron retorts, a space was always left at their ends to allow for the necessary expansion of the metal; but, as clay retorts neither expand nor contract with the heat, such precaution is unnecessary, but, in order to avoid the risk of their ends being broken out by the scoop when charging, they should be placed in such a manner that their ends abut against the wall, and, should the retort be too short, the space between the end and the wall should be filled in with brickwork.

The best cement for attaching the mouthpieces to clay retorts is made by mixing one-third, by measure, of ordinary iron cement, without sulphur, but with excess of sal ammoniac, with two-thirds of fire-clay, well mixed with water to the consistency of dough.

In fixing the mouthpieces, the face of the retort is chipped, so as to present a rough surface; the bolts are then placed and embedded in cement. The surface of the retort, being well wetted, is then plastered with the same cement. The mouthpiece, being perfectly clean, is also wetted and plastered in like manner, and when placed in position is screwed up gently; afterwards, as it dries, from time to time, the nuts are tightened. The joints of mouthpieces attached in this manner seldom leak. We have tried other cements, but have found none equal to that described.

Every gas-works should be provided with an experimental carbonizing and purifying apparatus, so as to enable the manager to make a trial, at an hour's notice, of the various kinds of coal he may have occasion to employ. In foreign works this is indispensable, as it frequently happens that purchases have to be made on the spot, and often to be decided in the course of a few hours. In large works, the experimental retorts should be capable of distilling the hundreth part of a ton—22·4 lbs. of coal—with a holder of a capacity of 100 or 150 feet. In small works a less apparatus is sufficient, the retort containing 2·24 lbs. of coal, and the holder of the capacity of 20 feet.

With respect to the size of furnaces or their area, this is a question of great importance, but hitherto no fixed law has been established on the point. Dr. Schilling has been at some pains to present a list of such as are adopted by different continental engineers, but there is such a marked variation in their opinions—one giving the same area for a setting of five retorts that others employ for settings of one and two retorts—that no reliance can be placed on them.

The cost price of clay retorts varies considerably; by some makers they are sold by the foot run, according to tariff of the different sizes and forms, and by some continental manufacturers they are sold by weight, so that there is a difference of about 50 per cent. in the first cost of these articles. As already stated, it is intended to present drawings of various settings, from one to twelve retorts, when the question of cost will be referred to.

(*To be continued.*)

FAVERSHAM GAS COMPANY.—The annual general meeting was held on the 12th inst., the chair being occupied by Alderman Edmett, of Maidstone. The balance-sheet and profit and loss account, which had been audited, were passed; and the recommendation of the directors, that a dividend of 10 per cent. should be declared, was unanimously adopted. The directors recommended that the price of gas to private consumers should be reduced to 5*s.* per 1000 feet., subject to a further reduction of 5 per cent. upon prompt payment, the same to take effect from July 1. The meeting adopted this recommendation also. The retiring directors and auditors were unanimously re-elected, and the proceedings terminated with the usual vote of thanks to the chairman.

GAS EXPLOSION AT ARBROATH.—An explosion of gas occurred in Keptie Street on Saturday evening, Aug. 15. Gas seems to have been escaping from some of the street-mains, and having found its way into a drain, emitted a strong smell. To ascertain the cause some of the people placed a light to a grating connected with the drain, and immediately the gas exploded, bursting the drain and scattering the fragments in all directions. The explosion was accompanied by a very loud report, which drew a large number of people to the spot. Among the *débris* were the fragments of a grating which had been smashed to pieces by the force of the explosion.

THE LIVERPOOL GAS COMPANY AND THE DESTRUCTION OF THE LIVERPOOL LANDING-STAGE.—The Mersey Docks and Harbour Board have intimated to the Liverpool Gas Company that they hold the company responsible for the destruction of the landing-stage by fire. The conflagration was alleged to have arisen, as will be remembered, by the carelessness of the plumbers employed in joining the gas-pipes below the stage. The company notify their intention of taking such measures as may be necessary for the protection of their interests.

Correspondence.

GIROUD'S RHEOMETER.

SIR,—It is not, and never was, my intention to enter into a polemical discussion about the respective merits of Sugg's dry lamp-governor and Giroud's rheometer. Indeed, I said quite distinctly in my letter of the 29th of July (which you kindly reprinted in your No. 586) that I had no wish to disparage the dry governor, about the excellence of which there is hardly any difference of opinion.

My object was simply—1. To point out an evident mistake which Mr. W. Sugg makes in judging the *theory* of the rheometer. 2. To state that in *practice* I had found the rheometer to be everything that one could wish. Both these assertions I fully keep up, since Mr. W. Sugg, in his letter of the 7th inst., has not, according to my opinion, proved them to be false.

If the theory of the rheometer, as explained by your Paris correspondent, does not convince Mr. Sugg. I think he could not do better than read M. Giroud's treatise, "*De la Pression du Gaz*" (Paris, 1872). This book is rather lengthy, I own, but it is very well worth the notice of every man in the profession.

Since the gas passes the orifice, O, of the bell at the pressure $P-P^1=\frac{R}{S}$, and R and S are constant, there cannot be the slightest doubt that this pressure, $P-P^1$, will be a constant one. The diameter of the orifice itself being constant *per se*, I think I have not said too much in asserting that your Paris correspondent has "proved to evidence" the constancy of the volume of gas paid out. I repeat, therefore, unless the burner used was *too small* for the rheometer, the size of the burner has *no* influence upon the consumption of gas.

Just as little influence has the initial pressure, P; because P^1 will vary accordingly, and the difference, $P-P^1$, will remain constant.

The rheometer, therefore, does *not* require readjustment if a larger burner was substituted.

I did not say in my last letter that it was *desirable* to substitute a larger burner than needed, although it would be so, within certain limits, because the gas is then consumed at a minimum of pressure at the point of ignition.

For too small a burner, a Giroud rheometer would be simply no fit—readjustment would here not answer the purpose.

When I said that gas companies had no longer an interest to discuss the size of the burners, I meant that they were in a position to leave the purchase of the burners (in one form or another) to the municipality, which could at free will choose larger burners or smaller ones, without being able to increase the consumption of gas in public lamps. If Mr. W. Sugg says that disturbing causes (undue friction, &c.,) can influence the rheometer, I am, of course, quite of his opinion; but if such is the case, the apparatus is clearly out of order, and I only discussed the theory when the thing was working as it ought. I think that every instrument (also Sugg's governors, though not often, I confess) *can* get out of order; but I certify that I have made experiments with five or six dozens of rheometers without finding fault with a single one of them. I must add that I think Mr. Sugg makes a mistake in asserting that the rheometers have a *guide-rod*. The first ones made were, I think, supplied with such a rod or wire; but all the rheometers I have seen since then consist only of three parts—viz.,

1. The body, with annular tank.
2. The copper bell, with cone-valve at top.
3. The cover.

It could only be quite lately (I doubt it very much) that M. Giroud had returned to the old plan of providing the bell with a guide.

Mr. Sugg is perfectly right in saying that his lamp-governor *with* the steatite burner is a regulator for constant (I should say, for *very nearly* constant) volume. The difference between his and Giroud's governors is only that the latter regulates the constant volume *independent* of the burner.

The rheometer begins to work and to do its duty with 5 millimètres of pressure. I have tried it with 6 inches of pressure, and found it to work equally well as with 5 or 6-10ths.

Upon the strength of the foregoing I positively contradict Mr. Sugg's final remark that "burner and governor must be considered one instrument, and that any alteration or injury to one part or another must be followed by the removal and readjustment of the whole apparatus."

I know this to be the case with Sugg's governor, but it is *not* so with Giroud's.

On page 550 of the *Munich Gas Journal*, 1871, I find the interesting news that the gas-works of Lyons, in France have adopted Giroud's rheometers with *Argand* burners for street-lights. Of course, I do not approve of the choice of the burner, but the fact of this choice having been *possible* for public lamps speaks volumes in favour of the rheometer.

Aug. 14, 1874. CIVIS ROMANUS.

DIP-PIPES.

SIR,—The attention of the directors of Caffall, Thomas, and Co., Limited, has been called to the report, in your issue of the 4th inst., of the meeting of the North British Association of Gas Managers, at which Mr. George Boyd, of Alloa, read a paper upon an improved dip-pipe, of which he claimed to be the inventor, but from using which he had been "interdicted" by Messrs. Caffall and Thomas.

As Mr. Boyd so boldly lays claim to the invention which Messrs. Caffall, Thomas, and Co., have patented, and denies that he has copied their invention, the directors cannot allow the matter to pass unnoticed.

Messrs. Caffall and Thomas had singly and together, for between three and four years previously to the present year, been engaged upon their invention, at a considerable expenditure of time and money, and their labours have resulted in their patenting it, which they did on the 6th of February, 1874, Mr. Thomas having, in April, 1873, obtained another patent, upon which Mr. Caffall and he improved still further. They never heard or saw anything of Mr. George Boyd, or his alleged invention, until June 30, 1874, when a description was given in the JOURNAL OF GAS LIGHTING of that date, and a statement made that the invention had been in operation at the Alloa works for a considerable time.

Two of our representatives went to Scotland and called upon Mr. Boyd for an explanation. He then merely claimed improvements in levelling the extension piece on the outside edge instead of the inside one, and substituting a pipe sealed in the liquid in the hydraulic main, in the place of the stuffing-box, thus clearly establishing the fact that his apparatus was simply an attempt to improve that already patented by us. Messrs. Caffall and Thomas's patent includes levelling the pipe either inside or outside, besides other modes described in the specification; and the stuffing-box (which Mr. Boyd declares to be useless, without having experimented and tested it as we have done) has been in practical working for 18 months without repacking or giving the least trouble, and is decidedly preferred by us to the pipe offered as a substitute, which formed part of an old patent long since abandoned.

Mr. Boyd also showed our representatives a number of sketches and drawings, and stated that he had kept his eye on all that appeared in this JOURNAL for some time. This we can readily believe, as his sketches appeared to be a combination of the different patents taken out during the last two years for the purpose of removing pressure.

He had the moveable cup patented by Mr. A. Thomas, but raised by a lever, with the fulcrum in front instead of behind the lifting-rod, which then worked through a stuffing-box.

This drawing was afterwards altered in pencil to correspond with the first patent of Messrs. Caffall and Thomas, by using the back standard and counterbalanced lever, which makes it almost self-acting; and, in order to have some point on which to endeavour to rest a claim, Mr. Boyd appears to have wished to do away with the stuffing-box. His first idea seems to have been to combine the invention of Mr. Valon, of Ramsgate, with Messrs. Caffall and Thomas's first patent, for he had a drawing to that effect.

Mr. Boyd admitted to our representatives that he had not actually used any appliance of the kind until our company's advertisement in this paper was shown to him by Mr. Peebles, who supported him at the meeting, and then, to use his own words, he "thought it time to do something." He then appears to have boldly selected ours as being the best of those upon which he had kept his eye, and, after spoiling it (to our idea) by substituting the tube, already described, in place of the stuffing-box, he on the 30th of June last alleges that his apparatus has been used for "a considerable time," which, upon investigation, proved to have been a trial of about a month upon a single retort, and long after the date of our patent.

Our solicitors were then instructed to insist upon the Alloa Gas Company at once taking down and ceasing to use the apparatus put up at their works, or paying a royalty to our company for the same, and to warn Mr. Boyd not to do any further act in derogation of our patents, and to inform him that whether the company would proceed against him in respect of the infringements he had already committed would depend somewhat upon the course the Alloa Gas Company pursued with regard to the apparatus at their works. This was done, and on July 13 last, the day before the meeting of the North British Association of Gas Managers (and this is a significant fact), the solicitor of the chairman of the Alloa Gas Company and of Mr. Boyd replied that he had advised that they must give way, and either pay the royalty or take down the apparatus, and stated that the latter alternative had been chosen, and that the apparatus would be taken down that day, as Mr. Boyd had found that the invention was "of no practical utility."

This, we expected, would be the last we should hear of Mr. Boyd and his so-called invention, but we were not a little surprised that he should, after what had taken place, boldly appear at a public meeting, and again lay claim to what it was admitted had not been tried in a practical manner, or even heard of, until some months after the date of our own patent; but it is satisfactory to note the testimony he there bears to the "practical utility" which he had depreciated when compelled to yield to our demands.

Further comment on the matter is needless, and I trust to your fairness to insert this letter in your next issue.

W. D. CHILD, London Manager,
pro Caffall, Thomas, and Co., Limited.

28, *Gracechurch Street, E.C., Aug.* 12, 1874.

THE REMUNERATION OF GAS MANAGERS.

SIR,—The remarks I made on this subject, in my address at the meeting of the British Association of Gas Managers, in June last, have been abundantly justified, not only by your own comments and letters that have appeared in the JOURNAL, but also by numerous statements that have been made to me; and the question seems to be brought to a climax in the account given in your last issue, of objections on the part of the ratepayers of a Yorkshire town to the action of the local board, in giving a moderate increase of salary to the manager of the gas-works—an increase which I can, from personal knowledge both of the works and the manager, state to be well deserved.

The existence of such an amount of dissatisfaction indicates a defect in the present system, which it would be to the interest of all parties to correct. I am not so foolish as to suppose that any system whatever can make all men contented, but a just plan removes all real ground for dissatisfaction, while an uncertain and capricious one simply encourages it.

It is an indisputable fact that the success of a gas undertaking depends almost entirely upon the manager. A board or a committee may completely neutralize the efforts and abilities of a good and capable man, but they cannot bring success to a concern where the manager is incompetent, unless by the term success is meant *merely* the payment of full dividends, which may be attained quite independently of good management by a very simple process—raising the price.

It is also an indisputable fact that, in commercial matters, men will and do work better when their remuneration depends upon results—a principle perfectly just and continually extending, all piecework being based upon it. The Government have adopted it as the basis of all grants made in aid of national education, and in houses of business it is largely applied, either by servants being paid a commission in addition to salary, or by giving them a share in the business.

The chief arguments in favour of such a system are, that it is just to the employed, it is to the interest of the employer, and it is quite practicable, having already been adopted in various places, and is always applied to gas collectors.

It may be carried out by paying a minimum salary and giving a commission on profits, with a proportionate increase of commission for every reduction of price, which would ensure the participation of the consumers in the prosperity of the gas undertaking; in fact, it

might be so arranged as to render the interests of the gas proprietors, the gas manager, and the gas consumers identical.

Many managers, in addition to their ordinary work, design and construct all new plant required by the increase of business. In some cases this is paid for by commission, but objection is justly taken to such a plan, on the ground that it may encourage an extravagant outlay on new work; still, such work should be paid for, as, in cases where the manager is either not competent or is unwilling to take the responsibility, an outside engineer is called in, who charges 5 per cent. on the cost. Now, payment by results may very well include this, while it would ensure the work being done at the lowest cost.

Payment by results would also prevent incompetent men from receiving more than their deserts, and would soon end in getting rid of them altogether; while, with competent men, it would tend more than anything else to retain them in the service of the company or corporation; it would give them a direct inducement to extend the business, since their pay would increase in proportion, and leave them without an excuse for yielding to the very plausible temptations to which all are exposed to increase their incomes by the acceptance of commissions.

London, Aug. 24, 1874. GEORGE LIVESEY.

SANATORY.

SIR,—Moses, when leading his dirty brethren away from the "fleshpots of Egypt," soon found it necessary to institute sanatory reform among the tribes; and he commanded them, when they went forth, to use a paddle, with which to dig a hole and afterwards to fill it up—a sanatory precaution still prevalent with cats when on similar object bent. There was a considerable amount of sanatory knowledge in this injunction—indeed, it is probable that Mr. Moule got here a hint when inventing his earth closet, for it is a fact that dry earth has a wonderful affinity for all those gases which offend the nostrils, but which, if retained in the earth, much enrich the land.

Acting on the adage which sets forth how clean the streets would be if every one would sweep clean before his own house, I have for several years utilized the whole of the household "secondary products" on my orchard and garden, with results that have proved that, unless in the largest centres of population, where land is too distant, there need be no difficulty in getting rid of our sewage, but a very great benefit arise from the application thereof to the growth of almost every vegetable that is brought to our tables.

Your paper, from the national ramifications of the class to which it is addressed, circulates in almost every village as well as in every town in the country, and the responsible positions held by your readers in each centre of population requiring that they shall be men of more than average intelligence, renders the JOURNAL one of the best mediums for circulating, both among the managers of gas-works, who have access to all classes, but also among the boards of directors, who are mostly the advanced men of their districts, all those questions that require to be discussed and perfected; and. as nothing creates more trouble to local boards as well as to private individuals than this question of the pollution of rivers and open watercourses, I have preferred to propose to give the results of my experience in yours than in any other class paper.

The pollution of rivers is not the only question to be considered, for it is a well-known fact that though you may pollute a river by sewage, if it be let to run a dozen miles in the sun, the sewage is nearly, if not entirely, gone, and the water has returned to its original purity; indeed, if this were not so we must all have been poisoned long ago, since we have many rivers into which the sewage of large towns are poured, and lower down this same water is drunk by still larger centres of population, and without injury. No; we have broadcast over the entire country in all rural districts, including the houses of the wealthy, innumerable cesspits, and in the same garden with this shallow pit is dug another, but of greater depth, into which a pump is placed, and from which is drawn the water used for all domestic purposes. These sewage-pits are often not more than a yard in diameter, by a yard or two in depth, and into these are poured, from the drains of the houses, all the offal of a year or more, before it occurs to any one to have them emptied; indeed, the overflowing of the pit is the stoppage of the drains, and the only premonitory causes that lead to its being cleaned out.

Now, the slightest reflection must convice any one that if one of those pits were stanch, it would overflow within the first month; but it is not, it is built dry wall fashion, hence it becomes a filter through which pass all the soluble matter, and if the soil be the much-coveted gravelly one, the whole substratum in time becomes saturated, and ultimately the filtrations from the shallow pit find their way into the deeper well, and then madam begins to wonder "what can be wrong with the tea." She "blows up" the tea merchant, and decides on having tea of a higher price. Presently, however, some of the children sicken, a doctor is called in, madam is also ill, and all are advised a "change of air," and if in the change of air they are fortunate enough to also get a change of water, they will likely recover—at least the stronger will—but perhaps one little tender plant sinks under the poison; it had not vitality enough left to throw it off, it dies, and the parish register contains a correct and scientific description of the especial disease that was developed by the poisoned water.

I will give a case that came under my own experience. A few years ago I bought a small freehold on which a retired City merchant and his family had lived for ten years. I intended it for my residence, and the place looked so charming that I asked, "What are its faults, that you leave those beautiful fine-grown trees and shrubs, that sweet river, on which you may boat and fish, and you within half an hour of London by rail, yet beyond its noise and smoke?" Well, there was no particular fault; they wanted to get into town, madam was dull, &c.

Before entering on possession I examined the drains and the supply of water, for we are beyond the main drainage area of the metropolis.

I found three w.c.'s on the premises, each terminating in a pit about a yard across, by the same, or a little more, in depth. I found two pumps, one in the house, the other in the stable-yard, and these procured their water from wells about 10 or 12 feet deep. I took a pint of the water of each, also a pint of the water from the river filtered, and, on testing them, I found that from the house pump to contain 70 grains of solid matter to the gallon, while that from the stable pump contained 40, and that from the river filtered water contained only 20, which latter is, I believe, about what London pipe water contains.

I opened the cesspits and found them full. I had them emptied; but they refilled themselves, five or six times, by infiltration of foul water from the land outside, each time the contents becoming cleaner. Studying the effect of this, and the condition of the water, I concluded that my predecessors had been drinking diluted sewage water for years, and doubtless without their knowing why. This must have had something to do with that change of mind which led them to leave the place.

Towards improving this condition of things, I formed an underground brick and cement tank in the garden, domed it over, and placed a pump in it. I led drains from all the closets into this tank. The laundry was in an outhouse, on the opposite side of the garden. I laid a drain from this, also, into the tank, so as to collect all the soapsuds, which I knew contained soap, soda, and all that was washed out of the linen, and these acted as a dilutive to the drainage from the closets; because I knew, from former experience, that closet water, undiluted, is too strong to be used by itself on the land I have now for several years used the contents of this tank as manure for my garden, and should you consider the foregoing worthy of insertion, I shall be happy, in a future number, to describe the *modus operandi* and the results, both as to the purification of the water and the enrichment of the soil of the garden.

4, *Cannon Row, S.W., Aug.* 22, 1874. GEORGE ANDERSON.

SOME MODERN APPLIANCES IN GAS-WORKS.

SIR,—I notice in your last issue that your correspondent, J. C. C., while commenting on what was said at the meeting of the North British Association of Gas Managers by Mr. Whimster, respecting the desirability of all dip-pipes having a liquid seal, says that there is but one invention which obviates the difficulty proposed by the above quoted gentleman.

Allow me, sir, in your next issue, to inform your correspondent that he is totally wide of the mark altogether, for my patent dip-pipes have purely a liquid joint or seal. They have neither ground faces, stuffing-boxes, nor anything of the kind. The moment that gas is being evolved from the retort the liquid is blown out into the hydraulic main, and as soon as that ceases, a fresh supply of liquid is sent in and the seal is thereby again restored.

They are also perfectly self-acting, which your correspondent says is not worth clamouring for, but I can scarcely think he was so serious as he might have been when he said so. J. G. HAWKINS.

Gas-Works, Sheffield, Aug. 22, 1874.

Miscellaneous News.

WATER SUPPLY OF THE CITY OF LONDON.

The Gas and Water Committee of the Corporation have just presented the following report to the Court of Common Council on the supply of water to the City in case of fire:—

To the Right Honourable the Lord Mayor, Aldermen, and Commons of the City of London, in Common Council assembled.

We whose names are hereunto subscribed of your Gas and Water Committee, to whom it was referred on the 3rd of October, 1872, to consider "If any improvement can be suggested in the water supply to the City of London in case of fire, either by fixing hydrants in certain of the public ways, or by other method, with power to confer with the directors of the New River Company and the Commissioners of Sewers on the subject;" and also "To inquire as to the practicability of devising some plan whereby an abundant supply of water can be drawn from the Thames, to be used for the purposes of extinction of fires, cleansing the streets, and flushing the drains of the City; to ascertain the probable cost of the necessary works, and report thereon," do certify that we duly proceeded therein. We were naturally desirous of obtaining every information upon so important and vital a question, and we were enabled, by the courtesy of the Metropolitan Board of Works, to obtain much valuable evidence upon the subject from Captain Shaw, the chief officer of the Metropolitan Fire Brigade, who attended your committee upon more than one occasion, and was anxious to give your committee every assistance and advice in the questions involved in the reference.

We also conferred with the directors of the New River Company, and had, by their direction, the co-operation and assistance of Mr. Muir, the engineer to the company, who kindly placed his valuable and long experience at our disposal, as shown in the replies he has given to a series of questions which were propounded to him by your committee, and which are hereunto appended.

We have now to report to your honourable court—

1. A statement of the past legislation and inquiry relative to the supply of water for extinction of fire.
2. The present condition of the water supply in the City.
3. The information given by the chief officer of the Metropolitan Fire Brigade on the water supply required for extinction of fires in London.

And 4. The conclusions we have drawn from this information, and our suggestions to meet the necessities of the case.

PAST LEGISLATION AND INQUIRY.

The subject of the water supply of London has often already been dealt with by public authority, and been matter of public inquiry. The enactments passed and the investigations made in this matter, so far as an efficient service of water for extinction of fire is concerned, may be briefly referred to, thus:

In the sixth year of the reign of Queen Anne (1707), an Act was passed "for the better preventing mischiefs that may happen by fire;" and therein it was provided that the churchwardens of each parish should, after May 1, 1708, make, place, and fix (at the charge of such respective parish) upon the mains and pipes belonging to any water-work whatsoever within the places aforesaid, such and so many stop-blocks of wood, with a two-inch plug, or such and so many fire-cocks, to go into each main or pipe, and to be placed at such distances in each or any street or place where such churchwardens for the time being should direct; and the top of such stop-block to lie even with the pavement of each street or place, to the intent such plugs or fire-cocks might always, upon occasion of any fire, be opened, and let out the water without loss of time in digging down to the pipes; and that all and every or any such churchwardens should, and thereby have power to, fix any mark or writing in the front of any house or houses over against the places, and for the better making known to the inhabitants where such stop-blocks and fire-cocks lay, and to keep an instrument in each house where the mark was, to open the plug or fire-cock (such stock-blocks and fire-cocks to be kept in repair at the charge of each parish where the same should be placed), and the plugs by the owners of the mains and pipes where the same should be fixed.—Penalty for neglect thereof £10.

There was a re-enactment of these provisions in the 14th year of the reign of George III. (1774.)

In 1821 a committee of the House of Commons was appointed to inquire into the whole subject of the water supply of the metropolis. This committee made a very comprehensive report, expressing, without hesitation, their opinion that the supply of water to London was very superior to that enjoyed by any other city in Europe.

In 1851 Her Majesty's Government introduced a bill to amalgamate all the companies then existing for the supply of the metropolis into one company, and to compel the new company to obtain water from such sources as the Secretary of State might direct, and otherwise improve the quality of the water. This bill was referred to a committee of the House, presided over by the late Sir James Graham. The subject was fully investigated, and it was ascertained that, by proper and suitable arrangements, the defects which had been found to exist might be remedied, and that a *sufficient* supply of water of good quality might be obtained from the valley of the Thames and from the other sources from which the companies drew their supplies.

The proceedings of the House of Commons, before the passing of the Act of 1852, show that the subject of water supply in London had been very fully considered, and that the House was in possession of the most complete information before it adopted the general policy prescribed by that Act. (See report of select committee, 1867, par. 11.)

The Metropolis Water Act of 1852 provided not only for the greater purity of the furnished supply, but also for its delivery on the constant system. The companies were obliged by this Act to give constant service whenever such service was required by four-fifths of the inhabitants of any district, and they altered and enlarged their works accordingly at great cost.

In 1852 the London water companies were, by their special Acts, made subject to the General Water-Works Clauses Act of 1847. By this Act it is provided that the cost of fire-plugs, and the expense of fixing and maintaining the same, shall be defrayed by the street authority, and that such plugs shall not be at any greater distance from one another than 100 yards.

In 1856 an examination was made by the superintending inspectors of the General Board of Health of all the extensions and improvements which the companies had then made, and these inspectors then reported that the requirements set forth in the Metropolis Water Act of 1852, in regard to works, had in all essential respects been fully and satisfactorily complied with by the several companies. They certified that the new works had not in fact been limited to what a bare compliance with those provisions would have fulfilled, but that measures had been adopted for the general improvement of the supplies, which evinced a proper anxiety on the part of the companies in the discharge of the duties of their position towards the public.

A select committee appointed by the House of Commons in 1862, to inquire into the subject of fires in the metropolis, reported that the annual number of fires in London had increased from 458 in the year 1833, to 1183 in the year 1861. They expressed their opinion that much advantage would be obtained from such a constant water supply as would always allow of an immediate application of hose-pipes to mains; and had evidence to the effect that this might be best accomplished by an entirely separate system of fire-mains. It was estimated that these mains would have a first cost of from £3,000,000 to £4,000,000, and would afterwards require for their maintenance and management an annual outlay of from £40,000 to £50,000, the water required for their use being furnished by the companies without charge. In the course of this inquiry it was stated by Captain Shaw (then superintendent of the fire-engine establishment of London) that the water supply of London was, generally speaking, efficient. He pointed out that, while it was superabundant in some places, it was seriously deficient only in "one or two spots," instancing the south side of the Thames, east of London Bridge.

In 1865 the fire-engine establishment of the insurance companies having been transferred to the Metropolitan Board, all the powers of local authorities in the metropolis respecting fire-plugs were transferred to the Metropolitan Board exclusively, and the water companies were required to provide, at the expense of the board, in any mains or pipes, plugs, at such places, of such dimensions, and of such form as the board might require; and ample power was conferred on the board to use the plugs, as also to shut off any mains to increase the supply of water for the purpose of extinguishing fires.

A select committee of the House of Commons, appointed in 1867 to inquire into the fire protection provisions of the United Kingdom, reported, as regards the metropolis, that much increase and improvement had taken place since 1862 in the Metropolitan Fire Brigade; that the stations of the Royal Society for the Protection of Life against Fire had been all taken over by the Metropolitan Board of Works; and that it was an important part of the duty of the then appointed Commission on Water Supply to secure facilities for the ready obtainment of an ample service of water at high pressure for extinction of fires. The first recommendation of the same committee was the introduction of a new Building Act, to require such modes of construction as would best prevent the occurrence and spread of fires. They recommended also such provisions as would secure the punishment of any culpable carelessness, proved to have been the cause of fire. They advised also the control of the sale of mineral oils, the prevention of an indiscriminate storing of goods in warehouses, and measures which might check the present frequency of "intentional fires."

Another select committee was appointed in 1867 to inquire into the results of the Water Act of 1852. They reported that they were satisfied that both the quantity and quality of the water supplied were so far satisfactory that there was no ground for disturbing the arrangements which had in these respects been made under the Act of 1852, and that any attempt to do so would only end in entailing a waste of capital and an unnecessary charge upon the owners and occupiers of property in the metropolis.

The Royal Commission on Water Supply also reported in 1869 (in regard to the quantity of water likely to be hereafter required for the supply of the metropolis) that 200 million gallons per day is the highest demand that need be reasonably looked forward to for the metropolitan supply, and that the various companies were prepared, with only moderate additions to their present engineering means, to supply a quantity little short of this amount. (See Report of Royal Commission on Water Supply, 1869, par. 261.)

By both of these last-mentioned reports, however, it was shown that, although the Act of 1852 had put obligation enough upon the *companies* to furnish a constant supply when required, there was need of some power to compel the *public* to prepare themselves for such service, by an indispensable alteration of house "fittings," before there could be any prevalence of the constant mode of supply in London.

Hence the introduction of the Metropolitan Water Act of 1871, whereby sufficient power for an exercise of the aforesaid compulsion upon the public was given to the metropolitan authorities, and to the companies, with appeal to the Board of Trade. The Board of Trade, also, by the same Act, received power, in certain cases, to require consumers to prepare for supply in the *constant* mode.*

By the same Act of 1871 the companies have been empowered, wherever constant supply is given, to provide and fix hydrants, after notice, at the expense of the Metropolitan Board of Works, without any further waiting for the action of the said board thereon. And the term "*plug*" of former Acts has been made to include *hydrant*, and all other apparatus necessary or proper in connexion with the companies pipes for supply of water in case of fire.

In accordance with this same Act, and during the year which followed its being passed, there was issued (with the authority of a commission appointed under the Board of Trade Inquiries Act of 1872, and after full inquiry) a code of "regulations" to secure the provision in houses of such "fittings" as have been proved by experience to be essential to an efficient constant service.

* By the Public Health Act of 1872, there has been a substitution of the *Local Government Board* for the *Board of Trade* in this matter.

The Present Condition of the Water Supply of the City.

The general effect of past legislation and public inquiry on the subject of the water supply of London as a protection against fire having thus been shortly sketched, it remains for your committee to state the results of the further inquiries which they have themselves been able to make.

As to that portion of the reference which relates to the practicability of devising some plan whereby an abundant supply of water can be obtained from the Thames, to be used for the purposes of extinction of fires, &c., it would appear from No. 6 of the replies of the engineer to the New River Company (see Appendix), that that body has "a right to pump to any extent from the river Thames below Blackfriars for supplies of a non-domestic kind," but with the ample supply and storeage at the command of the company, it is scarcely probable they would have occasion to exercise this right.

The City receives its water supply almost entirely from the New River Company.

The power of this company's works to meet the requirement of their district generally, and of the City area in particular, have been described in the replies which their engineer has furnished to the questions of this committee. These questions, with their answers, will be found at length in the Appendix of this report. They show—

1. That the company have now provision for a continuous daily delivery of more than 36 million gallons of water, with a present daily demand of about 25 million gallons.

2. That among the powers which the company already have for adding to their supply as demands increase, they have a right to pump to any extent from the river Thames below Blackfriars for any service of a "*non-domestic*" kind.

3. That exclusive of the ponds at Hampstead and Highgate (which hold together about 30 million gallons) the company have high-service reservoirs containing more than 20 million gallons, and further store, at lower levels, of more than 100 million gallons.

4. That the company's engine power is now sufficient to raise water into their upper reservoirs at the daily rate of 50 million gallons.

5. That the *pressure* of the company's supply in the City is now such as is afforded by a reservoir 126½ feet above Trinity high water; and that by the connexions which the mains of this reservoir have with the mains of other higher reservoirs, there might at once be thrown upon the City (but for the damage which would be thereby likely to be caused to house pipes) the greatly-increased pressure of a "head" of 220, 348, 420, or 430 feet.

6. That existing communications make all the contents of the company's various reservoirs available for use in the City.

7. That *seven* independent lines of main carry supply into the City.

8. That the company have 78 miles of pipes within the City, and that about 25 miles of these are *constantly under pressure*.

9. That the company have, at their own cost, placed more than 2100 fire-boxes and plugs within the City, doubling therein the requirements of the already-mentioned Water-Works Clauses Act, and bearing an outlay which from the first has been a liability of the authorities, parochial or local.

10. That the company have furnished the fire brigade with the keys, &c. which are required for the use of these plugs; and that, to meet as much as possible the difficulty which, from want of special training, the men of the fire brigade experience in the handling of these keys, the company further do all they can, by rewards and otherwise, to secure the early attendance of their *own men* at fires.

11. That the company's men are usually at the place of a fire before the engines have come up or are ready to work.

12. That all supply delivered by the company for extinction of fire is without charge.

Evidence of the Chief Officer of the Metropolitan Fire Brigade on the Water Supply required for Extinction of Fires in London.

The annual reports of Captain Shaw (the chief officer of the Metropolitan Fire Brigade) for the years 1866 to 1873 inclusive, show that the number and character of fires during the period referred to were as under:—

Years.	Numbers.		
	Serious.	Slight.	Total.
1866	326	1012	1338
1867	245	1152	1397
1868	235	1433	1668
1869	199	1373	1572
1870	276	1670	1946
1871	207	1635	1842
1872	120	1374	1494
1873	166	1382	1548

As to the quantity of water which is taken in the course of 12 months from the street-mains for fire extinction in the *whole area of the metropolis*, Captain Shaw has reported that it has not yet been much in excess of 8,000,000 gallons.

As to the *sufficiency* of the obtained supply, Captain Shaw (referring to the entire metropolitan area) has stated that supply was "short" in 12 cases in the year 1871, and in six cases during each of the years 1872 and 1873. With none of these cases, however, had the *City* to do, as subsequent evidence by Captain Shaw (to be hereinafter referred to) will show.

In regard to the facilities which exist for a *quick obtainment* of the provided supply at fires, Captain Shaw has repeatedly pointed out that these facilities (notwithstanding the best efforts of the water companies, whose zeal he commends) are not such as they ought to be, and can only be perfected by the provision of a sufficient number of constantly-charged hydrants.

Your committee have had the advantage of receiving a full restatement of these views in an interview with Captain Shaw, to whom the Metropolitan Board of Works most courteously granted permission to afford whatever information on this subject might be deemed of service to you. On the occasion of his attendance before your committee, Captain Shaw distinctly stated that there had been no difficulty from any insufficiency of water supply for extinction of fire in the City, whatever occasional delay there might have been in the obtainment of the required service in some places, from causes already specified. He referred at the same time to the difficulty which the distance of the water of the Thames from the river fronts of river-side premises at low tide manifestly causes in the discharge of water by the river fire-engines or "floats" against these fronts in fire.

In connexion with the need of hydrants and arrangements which their maintenance under a constant pressure would require, the engineer of the New River Company has stated:

1. That these hydrants might at once be placed by the proper authority on all the company's already constantly-charged pipes or "*mains*."

2. That in any places not thus furnished with constantly-charged pipes, the required hydrants could be provided for only by laying down branches from existing "*mains*."

3. That with no more constant supply in the City than at present exists, with the addition of about 5½ miles of new branched *mains*, which would be required, to provide for such a disposition of constantly-charged hydrants as

would ensure that every house within the City should have one, at least, of these hydrants within a distance of 50 yards from its street front, and that the cost of these mains would be about £10,000.

4. That with a maximum distance of 66 yards between hydrant and hydrant, about 900 of these would be required for the City in addition to those which the corporation have already provided, and it is estimated that the cost of these additional hydrants would not exceed £10,000.

From the foregoing statements it would appear that the *quantity* of the existing water supply to the City appears to be ample, the water required from street-pipes for the fires of the whole metropolis, in one year, being but a very small proportion of that which the New River reservoirs always have in store.

It also appears that the *pressure* of the present water supply of the City has sufficed hitherto, and may be greatly increased, without any additional works, whenever it may be expedient to add to it, but that notwithstanding the efforts made by the New River Company, and the arrangements to meet the requirements of the case, we are of opinion that, *the system of street-plugs, which makes the attendance of a turncock necessary before water can be obtained*, is not suitable to meet sudden emergencies, which must necessarily occur in every case of fire, and that to secure a quick obtainment of water it is absolutely essential for the protection of public property that a proper number of constantly-charged hydrants be fixed which will represent an immediate supply of water. So far as the cost of the hydrants which should be erected in the City is concerned, it becomes a question whether the said cost is one which should be borne by the Corporation, or left (as provided by the Fire Act of 1865) to be borne by the Metropolitan Board of Works.

Taking into consideration the important interests involved in the question of the supply of water in case of fire, your committee are of opinion that every possible means should be provided for the rapid extinction of fires by an *immediate* supply of water, and that although it has been shown that the supply and storeage of water is ample, the present means of procuring it at fires are not equal to the emergency of the case, and that this difficulty might be met by the use of hydrants constantly supplied with water; and having in view the immense amount of property within the City, and the extensive fires which from time to time occur within its area, we think that, for the protection of the citizens of London, it is highly desirable that the corporation should take the lead in establishing a system which there can be no doubt would be a most useful adjunct in preventing the extension of fires.

Should your Honourable Court agree with your committee that it is desirable the system of hydrants should be adopted in the City, we recommend that we should be authorized to further consider the questions involved in the reference, and also as to the best means of carrying it out, reporting thereon.

All which we submit to the judgment of your Honourable Court. Dated this twenty-ninth day of July, 1874.

APPENDIX.

(*Questions on Water Supply for the Extinction of Fire in the City of London, and the Replies of the Engineer to the New River Company thereto.*)

1. What quantity of water is daily consumed for *all* purposes in the New River Company's district?—The daily consumption of water in the company's district, for *all* purposes, is now equal to about 25 million gallons.

2. What proportion of this whole consumption takes place for *domestic* purposes?—*Domestic* purposes may be estimated to take, on an average, about 81 per cent. of this whole daily supply, that is, about 20,250,000 gallons.

3. What proportion of this whole consumption takes place for *non-domestic* purposes?—*Non-domestic* purposes may be estimated to take about 19 per cent. of the whole daily supply, that is, about 4,750,000 gallons.

4. What quantity of water is consumed in the City alone?—On account of the arrangement of mains, which is referred to in a subsequent answer (No. 14), and which adds not a little to the security of the City, no separate statement of the amount of all the water "consumed in the City alone," can be accurately given. But from measurements, and estimates made of deliveries for *street-watering*, *flushing*, and *urinals*, it may be reckoned that consumption for *these* purposes in the City has a daily average of about 192,000 gallons.

5. What quantity of water can the company now deliver daily?—The company have added, from time to time, to their means of supply, so as to keep their power of service well ahead of probable demands; and now have provision for a continuous daily delivery of more than 36 million gallons.

6. What power have they of adding this quantity for the extinction of fire?—Among the powers which they already have for *further* adding to their deliveries, as demands increase, the company has a right to pump, *to any extent*, from the River Thames, below Blackfriars, for supplies of a non-domestic kind.

7. What quantity of water do the company store at high levels?—Exclusive of the ponds at Hampstead and Highgate (which hold together about 30 million gallons), the company have high-service reservoirs, containing more than 20 million gallons.

8. What quantity of water do the company store at low levels?—The company have further store, at lower levels, of more than 100 million gallons.

9. At what rate can high-service reservoirs be filled?—Engines are always at work maintaining the store of the upper reservoirs, and there is engine power enough to replenish their reservoirs from the lower ones and from the New River at the daily rate of 50 million gallons.

10. What quantity of water is required for fire extinction?—The quantity of water required from mains, for the extinction of fires in the *entire metropolitan area* in the course of a *whole year*, will be seen from the annual reports of the chief office of the Metropolitan Fire Brigade to be equal to only a very small part of the quantity which the New River Company have the means (as above shown) of supplying within *their own district* in a *single day*.

11. What is the height of the reservoir which supplies the City?—The reservoir from which the *City* is supplied has an elevation above Trinity high water of 126·5 feet.

12. Has this reservoir connexion with any other?—Between the reservoir which serves the City and the company's other high-service reservoirs there are lines of connecting mains, which make the contents of *all* these reservoirs available for use in the City.

13. What are the heights of the company's other high-service reservoirs?—The heights above Trinity high water of the company's high reservoirs, not directly employed in the service of the City, are respectively 220 feet, 348 feet, 420 feet, and 433 feet. The pressure, which is due to any of these heights, might be thrown at once upon the City but for the damage which would be likely to be thereby caused to house-pipes, &c.

14. Is the supply to the City dependent upon one line of pipes?—Supply is carried into the City by *seven* independent lines of mains, all communicating with one another and with the mains of adjoining districts.

15. What length of pipes have the company laid down in the City?—The aggregate length of all the pipes which have been laid down by the company within the City is about 78 miles.

16. To what extent are these pipes constantly under pressure?—The "mains" or pipes which are *constantly under pressure* in the City have an aggregate length of about 25 miles.

17. What length of street is already provided with constantly-charged pipes?—The aggregate length of those streets in the City which are provided with *constantly-charged* pipes is about 20 miles.

18. What is the number of existing fire-plugs?—Upon all their existing pipes within the City (as elsewhere), the company have, at their own cost, placed and maintained fire-plugs, although the expense thereof has all along by law been the liability of parochial or local authorities. There are now within the City more than 2100 fire-plugs. The average distance of these plugs from one another is 50 yards. The distance is half of that which has been prescribed as a limit by law. In other words, the number of plugs provided is more than twice that which the law has required.

19. Under what arrangements have the brigade the use of these plugs at fires?—The company have furnished the fire brigade with the keys, &c., which are required for a use of the provided plugs. The men of the fire brigade being often, however, unable, from want of special training, to use these keys with effect, the company make the following additional arrangements to ensure the earliest possible attendance of their men at fires in their district. They periodically print and distribute lists of the names and addresses of all their turncocks, deputy-turncocks, and foremen; pay rewards for all first calls of their men to fires, and encourage their turncocks to promptness by special payments. Under these arrangements the company's men are usually at the place of a fire *before* the engines have come up, or are ready to work. *If* on any exceptional occasion an engine has had to wait for water at a fire, such waiting has been occasioned only by the inability of the firemen to use their keys, or by delay on the part of the police or others to call the turncock to the spot. Whatever supply of water is required from the company for the extinction of fire is delivered by them without charge.

20. What improvement might be made in the means of quickly obtaining water at fires?—The company have repeatedly pointed out that by *constantly-charged hydrants* there would be an end of the difficulty which the firemen now have in obtaining water for themselves at fires, and have shown that the New River district has already many miles (now 211 miles) of *constantly-charged* mains, on which the requisite hydrants might be placed whenever the authority, whose duty it is to provide the same, shall have arranged for so doing. Were all the houses in the City prepared (by being furnished with appropriate fittings) to receive a "*constant*" supply, the whole of the company's existing pipes within the same area might be forthwith constantly charged, and nothing further would then be required to facilitate the firemen's obtainment of water for themselves in the manner desired but the provision and erection of proper hydrants. Were it decided *not* to have a *general* introduction of the "*constant*" system of supply into the City, the hydrants wanted could be generally arranged for only by laying down new lines of pipes as branches from the now constantly-charged mains; and the number of these branches would depend upon the extent to which the present *intermittent* mode of service might be continued. Thus, if service within the City is made "*constant*" to those courts only to which it has been proposed by the Commissioners of Sewers to have a "*constant*" supply furnished, it would require about 5½ miles of the suggested branches, at a cost of about £10,000, to provide for such a disposition of constantly-charged hydrants as would ensure that every house within the City should have one, at least, of these hydrants within a distance of 50 yards from its street front. In addition to those hydrants which the Corporation have already provided, there would be required about 700 new hydrants, if these be so placed as not, in any case, to be further from one another than 100 yards. With a maximum distance of only 66 yards between hydrant and hydrant on the said mains, the number of new hydrants required would be about 900. The direct connexion of hydrants with *leading* mains instead of with "services" or *sub*-mains (an arrangement which the general continuance of *intermittent* service would involve), would have the disadvantage of making the said leading mains more liable to interruption for repairs, and would demand, therefore, such special care in the form and arrangement of the hydrants to be thereto fixed as would reduce to the utmost the risk of having mains, on their account, "shut down." On the other hand, it has to be observed that, with a continuance of *intermittent* service, there would be a less interference, by ordinary consumption, with the pressure of supply for the extinction of fire than there would be with a general prevalence of service on the "*constant*" system.

RATCLIFF GASLIGHT AND COKE COMPANY.

The Half-Yearly General Meeting of Shareholders was held at the Company's Offices, Cable Street, E., on Wednesday, Aug. 19—Mr. THOS. M. FAIRCLOUGH in the chair.

The SECRETARY (Mr. H. J. Baddeley) read the notice convening the meeting, and the following report and statement of accounts:—

The directors have much pleasure in submitting their report and accounts for the half year ended June 30, 1874.

During the past six months the works have been maintained in an efficient state of repair, but all outlay, not actually indispensable, has been suspended.

An addition has, however, been made to your plant, by the purchase of some freehold houses in Gold Street, adjoining the works, which the engineer advises will become useful to the company's future operations.

The accounts, which have been duly audited, show a net profit of £4681 9s. 4d.

Out of the available balance of profits, the directors recommend that a dividend upon the paid-up capital of the company, after the rate of £5 per cent. for the half year ended June 30, 1874 (less income-tax), be now declared, payable on and after the 3rd day of October next.

Dr. *Trade Account, for the Six Months ended June 30, 1874.* *Cr.*

Coals		£13,537	7 9	Gas	£16,329	8 1
Purifying materials		183	0 6	Public lighting	1,898	14 2
Salaries of engineer and clerk at works		385	0 0	Rental of meters	137	6 0
Wages		1,960	11 6	Coke	4,084	17 1
Repairs and maintenance of works and plant, and labour	£978 19 9			Breeze	140	1 5
Less old material sold	31 9 0			Tar	1,426	7 8
		947	10 9	Liquor	938	10 11
Salaries of inspectors and clerks in office		368	3 0	Rents	100	13 6
Repairs and maintenance, distribution, and labour		366	3 3	Miscellaneous receipts	160	4 5
Repairing and renewing meters		85	9 0			
Lighting and repairing public lamps		300	5 7			
Rents		180	15 8			
Rates and taxes		518	9 10			
Directors allowances		400	0 0			
Salaries of secretary, accountant, &c.		387	17 6			
Collector's commission		226	13 0			
Stationery and printing		34	13 6			
General establishment charges		88	19 7			
Auditors		15	15 0			
Depreciation-fund (leaseholds)		110	0 0			
Bad debts		96	3 6			
Interests on borrowed capital		391	15 0			
Net profit		4,681	9 4			
		£25,216	3 3		£25,216	3 3

The CHAIRMAN: Gentlemen, it is my pleasure to move—"That the report and accounts now read be adopted and entered on the minutes." Very few remarks are necessary on my part in asking you to pass this resolution. When you remember the high price of coal, and the reduced value of one of our principal products—coke—and remember, at the same time, the moderate price at which we are selling gas, I think you will agree with me that we have reason to congratulate ourselves that, as the result of our working for the past half year, we have arrived so nearly at the point of being able to pay out of our profits for that

period our accustomed dividend of 10 per cent. We are able to do so within a very small amount, and I feel sure you will be pleased with our success. For this result no doubt we are much indebted to the ability and energy of our officers—our engineer and secretary—and I know that you will appreciate their exertions. Before I sit down, I must express my own regret, and the regret of my brother directors present, that through ill-health our chairman, Mr. Bromley, and our colleague, Mr. Hammack, are not able to be with us to-day. We cordially hope they will soon be restored, and we shall, I am sure, heartily welcome them back again to their accustomed posts.

Mr. BADDELEY seconded the motion with much pleasure, feeling that the report they were asked to adopt was a most capital one.

The motion was put, and carried unanimously.

On the motion of the CHAIRMAN, it was also resolved—"That a dividend for the half year ending June 30, 1874, on the paid-up capital of the company, at the rate of 5 per cent, less income-tax, be now declared payable on and after the 3rd of September next."

On a motion of Mr. NUTTER, seconded by Mr. WILKINSON, a cordial vote of thanks was presented to the chairman and directors for their continued attention to the affairs of the company.

The CHAIRMAN acknowledged the vote.

Mr. WILKINSON proposed, and Mr. NUTTER seconded, a vote of thanks to the secretary and engineer of the company for their services, which was also cheerfully responded to.

Mr. BADDELEY and Mr. H. JONES respectively acknowledged the compliment paid them, and the proceedings terminated.

CAMBRIDGE UNIVERSITY AND TOWN GASLIGHT COMPANY.

The Ordinary Half-Yearly Meeting of Shareholders was held on Tuesday, the 28th ult.—the Rev. Dr. PHELPS, master of Sidney Sussex College, and chairman of the board of directors, presiding.

The following reports and statements of account, which had been printed and circulated, were taken as read:—

THE DIRECTORS REPORT.

The directors herewith submit to the shareholders a statement of accounts for the half year ending Midsummer, 1874, which accounts have been duly audited.

The increase in the gas-rental and diminished expenditure for coals have enabled the directors to present a more favourable profit and loss account than they had anticipated. They recommend a dividend for the half year after the rate of £7 per cent. per annum on the consolidated stock and on the amount paid up on the new shares, payable on the 1st proximo, free of income-tax.

The retiring director is Mr. Dennis Adams, who is eligible for re-election.

THE MANAGER'S REPORT.

To the Directors of the Cambridge University and Town Gaslight Company.

Gentlemen,—You are aware that, during the last two years, financial considerations, arising from the high prices of materials and labour, have compelled you to restrict the demands on the company's resources to the barest necessities of the business. Now that there seems to be some improvement in the profit and loss account, I venture to suggest, for the next year or two, should that improvement continue, a more liberal expenditure on the company's plant generally. I look forward also to the necessity of replacing, at no distant period, the old telescopic gasholder by a new holder in the outer ground. The space thus cleared in the yard will be of immense importance in further ultimate extension and improvement of the works.

I regret to state that during a short period, when a trial was being made of a coal of high illuminating power, but which unfortunately was found to deposit naphthaline in pipes exposed to the weather, the public lights were affected. But, with this exception, as indeed you will have observed by your fortnightly inspection of the tests and reports, the pressure, purity, and illuminating power of the gas have been above the statutory requirements.—I am, gentlemen, your obedient servant, WM. WOOD.

BALANCE-SHEET FOR HALF YEAR ENDING MIDSUMMER, 1874.

Dr. *Capital Account.* *Cr.*

Consolidated stock			£37,440 0 0	Expenditure on capital account		£36,589 4 1	
New shares—first call of £2 per share on 1872 shares			3,744 0 0	Less received for old materials		100 8 3	
Ditto—second call on ditto			3,744 0 0				36,488 15 10
Ditto—third call of £1 per sh.			1,872 0 0				
Loan: The executors of the late H.R. Evans, Esq., on mortgage			5,000 0 0				
Messrs. Foster's temporary advance			4,300 0 0				
Balance			388 15 10				
			£56,488 15 10				£56,488 15 10

Profit and Loss.

Coal carbonized			£6,796 12 3	Sale of gas and meter rents (less bad debts and allowances, £28 6s. 11d.)			£10,492 3 11
Supervision and labour			1,080 9 7	Fittings—profit (less bad debts, discounts, & allowances, £35 0s. 4d.)			93 8 3
Trade accounts			981 14 0	Residual products:			
Distribution:				Sale of coke (less bad debts, discounts, and allowances, £52 2s. 6d.)			1,584 6 3
Wages			425 5 11	Sale of tar			403 0 3
Trade Accounts			563 2 2	Ditto sulphate of ammonia			623 2 6
Miscellaneous:				Rents			9 18 3
Directors allowance			150 0 0				
Salaries			307 10 0				
Collectors commission			132 9 7				
Auditors			10 10 0				
Annuities			70 5 0				
Stationery and printing			85 19 8				
Rent			40 0 0				
Rates and taxes			555 14 11				
Interest			222 6 1				
Balance (half year's profit)			1,784 0 3				
			£13,205 19 5				£13,205 19 5

General Balance.

Revenue account			£1,784 0 3	Amount owing for gas			£6,078 19 6
Manager's ditto			300 0 0	Ditto coke			607 13 3
Banker's ditto			235 13 8	Ditto fittings			856 3 5
Floating assets, Christmas, '73		£8,213 18 8		Ditto tar			457 5 3
Balnce. of revenue account, Christmas, '73	928 7 1			Ditto sulphate of ammonia			150 9 5
	£9,142 5 9			Stock in hand:			
Less dividend, declared Jan. 29, 1874	1,170 0 0			Coals			572 5 6
		7,972 5 9		Coke			276 12 6
Unpaid dividends		34 19 9		Fittings			96 14 2
				Meters			862 6 7
				Capital account			388 15 10
		£10,346 19 5					£10,346 19 5

The CHAIRMAN, in moving the adoption of the reports, said he need hardly remind the shareholders of the difficulties through which the company had passed, and, he might say, through which they were passing. In his address on the occasion of the last half-yearly meeting, he held out some hopes that they might not have to have recourse to a certain Act of Parliament for relief. So far, it seemed, his anticipations had been verified, and he might congratulate the company upon the better aspect which had opened out before them, inasmuch as the directors had been able to recommend a dividend of 7 per cent. for the half year. He did not say there was any reasonable hope that coal would ever return to its former price; but it had diminished, and was still diminishing, so that he hoped they would not go back to their restricted dividend. Whether they would ever arrive at their rightful dividend without legislative relief he could not say. There was an association of gas and water companies holding its sittings in London, and its object was to do all it could to stimulate the Legislature to give relief to gas and water companies. He (the chairman) thought it ought to be so, but, of course, nothing could be expected this session, knowing its brevity and how much the Government had been engaged with national matters.

Mr. J. SWAN seconded the motion.

Mr. W. B. REDFARN called attention to the fittings account, which he thought very small, considering the opportunities of the company and the number of new buildings in the town. This might be attributable to the smallness of their stock.

Mr. BALLS said it was not wise to keep a large stock of fittings; indeed, it was not usual in the large houses of London and Birmingham. Pattern-books were kept. Even with a large stock it would be impossible to satisfy the varied tastes of the public, in addition to the risk the company would run.

The CHAIRMAN also intimated that it would be impossible to always have a large display. Pattern-books were a sufficient guide.

Mr. J. WALLIS complained of annuities generally, and gave notice of a motion with reference to Mr. Gifford's annuity.

The motion for the adoption of the report was then put and carried.

On the motion of the CHAIRMAN, seconded by Mr. REDFARN, a dividend was agreed to in accordance with the terms of the directors report.

Mr. ATKINS proposed, and Mr. WALLIS seconded, that Mr. Dennis Adams be re-elected a director of the company.

The CHAIRMAN, in putting the resolution, which was carried, said the services of Mr. Adams had been most valuable.

Mr. ADAMS thanked the shareholders for this renewal of their confidence. He was glad that the directors, after their many anxieties, were able to declare a dividend sufficient to raise their spirits. He hoped they would eventually be able to return to their old dividend of 10 per cent. The directors would most certainly look into the question of fittings.

The CHAIRMAN here read a letter from Mr. John Dennis, announcing his resignation of the office of auditor, he having now passed his 80th year.

The resignation having been received, Mr. John Death was elected auditor.

Mr. ATKINS, who was elected an auditor at the last meeting, took the opportunity of expressing his thanks to the shareholders for the appointment.

The CHAIRMAN proposed a cordial vote of thanks to Mr. Dennis, the retiring auditor; which was seconded by Mr. D. ADAMS, and carried unanimously.

Mr. WELSFORD proposed, and Mr. SWAN seconded, a vote of thanks to the chairman and directors.

The CHAIRMAN, in acknowledging the vote, promised that the directors would continue to do their best for the company. He hoped they had now "turned the corner," and that there was in view—he would not say how near or remote—a prospect of again dividing 10 per cent., which he was sure was only a reasonable dividend, considering the risk involved and the skill required in the manufacture of gas.

LIVERPOOL UNITED GASLIGHT COMPANY.

The Annual Meeting of the Shareholders of this Company was held on the 18th inst.—Mr. THOMAS EARLE in the chair.

Mr. GARNETT, the company's solicitor, read the report, which was as follows:—

"The accounts show the total income for the year ending the 30th of June last to have amounted to £409,078 2s. 1d., and the expenditure to £352,552 6s. 5d., the net profit being £56,525 15s. 8d., out of which £23,933 19s. 3d. has been already absorbed in payment of the reduced dividend declared at the last February meeting, leaving a balance remaining of £32,591 16s. 5d. This, with the aid of a small sum still standing to the credit of the reserve-fund, is just sufficient to provide the usual statutory dividends for the past half year, and the directors accordingly recommend that a dividend be declared at the rate of 5 per cent. for the half year on the ordinary consolidated stock of the company, and at the rate of £3 10s. on the consolidated B (7 per cent.) stock, and on the amount paid up in respect of the new £7 10s. shares. The deficiency of dividend for the whole year is thus 1½ per cent. on the ordinary stock. The directors deem it right to inform the shareholders that the Mersey Docks and Harbour Board have intimated their intention to hold this company responsible for the recent disaster at the landing-stage; in relation to which claim the necessary measures will be taken for the protection of the company's interest.

The CHAIRMAN, in moving the adoption of the report, said he hoped the statement of accounts (a copy of which had been sent to the shareholders) would be considered satisfactory. With regard to the future, the directors thought they would be able to earn a full dividend, even at the high price they had to pay for cannel, except some extraordinary circumstance occurred to upset their calculation. The additions at Linacre, which had been going on for some years, were now nearly complete, and would be of great service to the company. They had cost a good deal of money, but were quite necessary, owing to the increasing wants of the town. At one of the previous meetings of the company he (the chairman) had alluded to remarks which had been made with regard to the quality of the gas the company supplied; and he desired now to repeat, on the authority of the engineer—in whose statement he had the most perfect confidence—that their 20-candle standard had been constantly and most rigorously maintained. He (the chairman) was the more anxious that this should go forth to the public, because on a recent occasion a member of the Town Council, at a meeting of that body, or one of its committees, did not hesitate to state, if he was correctly reported, that the gas supplied by the company was inferior, and not over a 17-candle standard. Now he really thought that gentlemen in responsible positions, whose words were likely to carry weight, should fully inform themselves of the facts of the case, before making reflections upon the conduct of others, which could not fail to exercise an unfavourable influence on the public mind. There was a paragraph in the report stating that the Mersey Docks and Harbour Board had intimated their intention of making a claim against the company for the loss the board had sustained in the burning of the landing-stage, the board stating that the cause of the disaster arose from an act of one of the company's servants. He was sure that the meeting would agree with him that it was a subject that should not be discussed there. It was a question that must be settled elsewhere; and he must beg the forbearance of the shareholders in not entering into the subject. It was thought right to mention it in the report, so that the shareholders might know such a claim had been made; and he assured the meeting that the directors would do their best to protect their common interests.

Mr. C. TURNER seconded the motion.

Mr. J. K. TYRER asked what would be the future conduct of the directors with regard to the 1½ per cent. they had not declared.

The CHAIRMAN replied they had not the money now.

Mr. TYRER said persons dependent upon the money they had invested in the company would be glad to know what prospects there were of obtaining that sum.

The CHAIRMAN replied that the company had not the money now, and the directors had not considered what to do in the future. The amount in question was paid afterwards on other occasions.

Mr. TYRER said he mentioned the matter now advisedly, because the want of the 1½ per cent. drove the shares down to some extent in the market. He called the attention of the chairman, with a view to obtain an expression of his opinion to the fact, that there was power, under the 11th & 12th Vict., to reserve an amount to answer any deficiency which might at any time happen in the divisible profits of the company. The 1½ per cent. was a deficiency, and if there was any prospect of having it paid out of the reserve fund it would satisfy people.

The CHAIRMAN said they had no reserve-fund.

The report and accounts were adopted.

Messrs. Thomas Earle, Charles W. Reade, Samuel S. Thompson, J. A. Tinne, and J. A. D. Watson were elected directors; and Messrs. D. O. Bateson and J. A. D. Watts auditors.

A vote of thanks to the chairman concluded the proceedings.

LIVERPOOL WATER SUPPLY.

THE RIVER WYRE SCHEME.

An increased supply of water for the town of Liverpool having become imperative, several schemes have been submitted to the consideration of the Town Council for obtaining it. Amongst these is one for utilizing the resources of the eastern or upper portion of the river Wyre, in North Lancashire, an account of which has just appeared in the *Liverpool Mercury*. The writer says the river Wyre scheme was first brought prominently before the council by Mr. Joseph Jackson, C.E., of Bolton, in his report on the subject of the future water supply of Liverpool presented to the council in May last. Mr. Jackson, after carefully inspecting the various sources from which it has from time to time been suggested that a supply of water adequate to the future wants of Liverpool might be obtained, came to the conclusion that the river Wyre was the best, and drew out the Wyre scheme. Under this scheme it is proposed to obtain a supply from the head waters of the river Wyre, which are found in a wide tract of moorland, some 18,000 acres in extent, east of the Preston and Lancashire Railway, and extending to the ridge forming the boundary between Lancashire and Yorkshire. At the southerly end of this land two streams—the Brock and the Calder—rise on what are known as the Bleasdale moors, and running in a westerly direction, become tributaries of the Wyre, the Brock joining the latter river above St. Michael's-on-Wyre, and the Calder joining it above Garstang. The Wyre proper is derived from the moorland north of the Bleasdale moors, and, taking first a southerly and then a westerly direction, empties itself into the sea at Fleetwood. It is proposed to take the water of the Brock and the Calder, with that of several small streams, near to the town of Chipping, which is on the eastern edge of the Bleasdale moors, and also the water of a small district on the southerly side of the Wyre Valley, and impound it all in an immense reservoir, as large as all the Rivington reservoirs together, on the Bleasdale Moor, from which it would be sent to Liverpool, being delivered at the north end of the town near to Walton Church. Some 12,000 acres of land would drain into the Bleasdale reservoir, which, it is estimated at a moderate calculation as to the rainfall (namely, 28 inches available), would be capable of yielding upwards of 20 million gallons per day, provided that instead of giving compensation in water for the streams taken, a money compensation were given. Should a still larger supply be needed, water could be obtained from some 6000 acres of land to the north, at the head of the valley of the Wyre proper. This would yield an additional supply of 10 million gallons daily, giving a possible total from the Wyre district of 30 million gallons per day.

The water yielded by this district, except the small quantity from Chipping, would be similar in quality to the water of Rivington, the geological formation from which it flows being similar. The Chipping water rises in the limestone formation, but the admixture of this with the soft water of the Wyre district would, in the opinion of Mr. Jackson, be beneficial rather than otherwise. The distance of the Bleasdale reservoir from Walton church by the route the pipes would have to be laid would be about 40 miles, or 31 to a reservoir at Scarth Hill, Ormskirk, the point at which the pressure would be put on to supply Liverpool. The advantages claimed by Mr. Jackson for the Wyre scheme are—its comparatively short distance from Liverpool, and consequently its cheapness; the ample supply that it would yield for many years; and the facilities afforded by the formation of the district for impounding the water in one reservoir. The estimated cost of the scheme proper is £1,679,518; or to obtain the additional water which might be brought in from the head of the Wyre Valley, £226,583 more, making a total of £1,906,101. This sum is much below the estimated cost of the Windermere scheme, which is the next in favour with Mr. Jackson to the Wyre scheme.

The site of the proposed reservoir is eminently suitable for the purpose to which it is to be devoted. The hills just here form a rough half circle, and it is proposed to construct an embankment to close in the open side, and so make the reservoir. The greater part of the work necessary for the construction of an immense natural reservoir here has already been done by nature, and the engineers have simply to finish it. An idea of the great size of the proposed reservoir will be obtained when it is stated that it will enclose a body of water almost a mile square. The embankment will, in the highest parts, be 110 feet in height, and the reservoir will cover some 550 acres, and be capable of holding 3750 million gallons of water. The land on which the reservoir is proposed to be constructed is from 1500 to 1700 feet above the level of the sea, so that the water will travel to Liverpool by gravitation. This, of course, renders pumping, which was a very serious item in the estimates of the Windermere scheme, unnecessary. The proposed reservoir will take in part of the valley of the river Brock, which will, therefore, flow into it naturally. The water of the river Calder, which is to the north of the Brock, it is proposed to bring into the reservoir by a conduit; and similar means will be taken to get into the reservoir the water from Chipping.

LEWES GASLIGHT COMPANY.

The Annual Meeting was held on the 17th inst.—Mr. E. MORRIS in the chair.

The CLERK (Mr. E. Hillman) read the following report of the directors:—

The balance of £1889 16s. 3d., as shown by the statement on the other side, is the profit for the year, and with the balance of the dividend account of last year, £555 7s., amounts to £2445 3s. 3d. Of this sum the directors certify that £1697 may be divided among the shareholders, being a dividend at the rate of 10 per cent. per annum (3 per cent. having been already paid on account thereof), that £200 be added to the reserve, and that £548 3s. 3d. be retained on the dividend account. It will be seen by the annexed account that, compared with the previous year, the profit is £405 4s. 11d. less, arising from the increased cost of coals. But as the directors have recently entered into a more favourable contract for coals, they feel justified not only in recommending a dividend of 10 per cent. per annum, but also a reduction in the charge for gas, from 5s. to 4s. 7d. per 1000 feet, to commence from the 25th of December next. There have been fourteen meetings of the directors since their election, of which Mr. Charles Parsons has attended all; Messrs. Ebenezer Morris, John Latter Parsons, and John Bates, thirteen; Mr. Robert Crosskey, eleven; Mr. William Farnes, nine; Mr. John Hodgkin, seven; and Mr. Henry Browne, two; Mr. John Saxby has not attended.

The CHAIRMAN, in moving the adoption of the report, said: If not very elaborate, the report was, he considered, very satisfactory. The directors had advised a dividend of 10 per cent., instead of 9, as last year. It was true they might have paid 10 per cent. on that occasion, but they felt it was better only to divide 9 at that time, because they felt they were approaching a crisis with regard to gas companies, in consequence of the unsettled state of the coal market. They had now, if he might so speak, "weathered the storm," and, under the circumstances, they had not only recommended a dividend of 10 per cent for the year, but they had also agreed to reduce the price of gas from 5s. to 4s. 7d., to commence in December next.

Mr. CROSSKEY seconded the motion.

Mr. GODLEE observed that the chairman's modesty had only taken credit for the dividend and the reduction of price, but he thought the directors might also do so for the £200 placed to the reserve. He (Mr. Godlee) was very much struck with the large return from the residuary products, especially that for sulphate of ammonia, which was a new item within the last few years.

Mr. LENNY drew attention to the fact that the receipts this year were only £229 in excess of those of last year, and asked how in the face of that the directors thought they could reduce the price of gas to 4s. 7d.

Mr. GREEN asked if the tank in the timber-yard was valued at anything more than old iron, as it would require a large expenditure to make it of any use.

The CHAIRMAN, in reply to Mr. Lenny, pointed out that the directors had, as stated, entered into a contract for coals at a rate which warranted them in reducing the price to consumers, otherwise they would not have done it. Replying to Mr. Green, he said that so far from the tank being only valuable as old iron, it was a very valuable adjunct to their plant. The directors did, however, for the purpose of making it doubly safe, and improving it, propose to expend on it about £150.

The report was then unanimously adopted.

Mr. HODGKIN moved—"That a dividend of 10 per cent., as recommended by the directors, be now declared, and ordered to be paid by the treasurer, to and amongst the shareholders entitled thereto, less the amount already paid as an *ad interim* dividend."

Mr. GODLEE seconded, and inquired if the directors had not the power of altering the price of gas without coming to the present meeting.

The CHAIRMAN replied in the affirmative.

Mr. GODLEE said that he approved of the reduction, but he hoped they would think well before they reduced the price to 4s. 2d., as they had done once before. He was interested in another company whose rental was double that of Lewes, and who charged 6s. per 1000 feet.

The CHAIRMAN intimated that it occurred to the directors that it was just possible there might be some feeling expressed at the meeting with regard to the time when the reduction should commence, and they were ready to receive any suggestion on the point.

Mr. LENNY: When did the new contract for coals commence?

The CHAIRMAN: Last April.

Mr. GREEN said he would have preferred a smaller dividend, and that the wages of the men should be increased.

The CHAIRMAN said this was not a question for the meeting.

The resolution was carried unanimously.

The CLERK announced that Mr. Saxby had expressed his wish to retire from the board of directors.

The remaining directors were thereupon re-elected, and Mr. James Broad was elected in the place of Mr. Saxby.

The remuneration of the directors was increased from £60 to £100 per annum, and the retiring auditors were re-elected, their remuneration being increased from three to five guineas each.

Mr. GODLEE proposed that the directors be requested to apply at the earliest possible period for an Act of Parliament, feeling that the company was of sufficient importance to have one. It might cost £500, but he felt that the advantage that would be gained by it would amount to ten times this amount. He had seriously considered the matter for years, and had always been of the same opinion as now.

The CHAIRMAN asked if under an Act of Parliament their dividend would not be limited to 7 per cent.

Mr. GODLEE understood not for the original shares. It would for them, he believed, be limited to 10; and they could, if they had profits, take amounts to make any deficient year to that.

Mr. LENNY doubted whether that would apply to more than a few past years.

Mr. GODLEE thought perhaps that would be the case, but the main thing was to secure the 10 per cent. for the future.

The CHAIRMAN urged that as this was such an important matter Mr. Godlee should withdraw the motion, and that the directors should consider it with his assistance.

Mr. BATES objected to the incorporation of the company. They had, he contended, many privileges which they would not have under an Act of Parliament.

Mr. GODLEE withdrew his motion, and proposed that the directors should consider the propriety of applying for an Act, and report at the next meeting, and this motion, with the addition suggested by the chairman, that Mr. Godlee should assist the directors in their deliberations, was agreed to with three or four dissentients.

The proceedings closed with the usual complimentary votes.

DARLINGTON AND SCOTT'S APPARATUS FOR DRAWING AND CHARGING RETORTS.

The engravings on the opposite page illustrate an invention recently patented by Messrs. Darlington and Scott, for "Improvements in machinery for charging and drawing gas-retorts." We recently (page 170, present volume) gave an abstract of the specification of this patent, a perusal of which, in conjunction with the drawings, will convey a very clear notion of the special features of the apparatus, and will render a lengthened description here unnecessary. We, therefore, only refer to one or two points which have not been hitherto fully set forth.

The inventors, who have had considerable experience both in the manufacture of gas and as practical machinists, claim for this apparatus that it is more simple and less cumbrous than many of the stoking machines hitherto manufactured, and they point out that it is capable of being adapted to any existing settings of retorts. It is comparatively light and portable in construction, and the scoop of the charging machinery can be either filled by hand or by an arrangement of shoots from the coal stores direct. The scoop is supported upon the boiler in such a manner that it is capable of vertical and circular adjustment upon and around the boiler, while the entire machinery is moveable towards and away from the retorts, and across the front of them when in practical working. The arrangements for adjusting the scoop vertically, so as to bring it in line with any of the retorts, have already been described.

The rake is provided with similar means of adjustment; it also has combined with it mechanism for causing it to turn on its axis while entering the retort. This rotative movement is imparted to the rake by a rack fixed on the side of the travelling carriage and a pinion attached to the vertical shaft or spindle. The pinion is controlled by a pawl and ratchet-wheel, so that it can turn only in the proper direction. The shaft of the rake is geared by bevel-wheel, with the vertical shaft or spindle, and by the rack and pinion through this gearing the rake is operated to turn on its axis on entering the retort, but is withdrawn without turning. The rake passes therefore freely into and through the contents of the retort, disturbing and breaking up the coke, and, in returning will draw the contents with it from the retort. As the rake is not required, like the scoop, to turn away from the retorts, the gearing for turning the mechanism round the boiler is not provided in this machine.

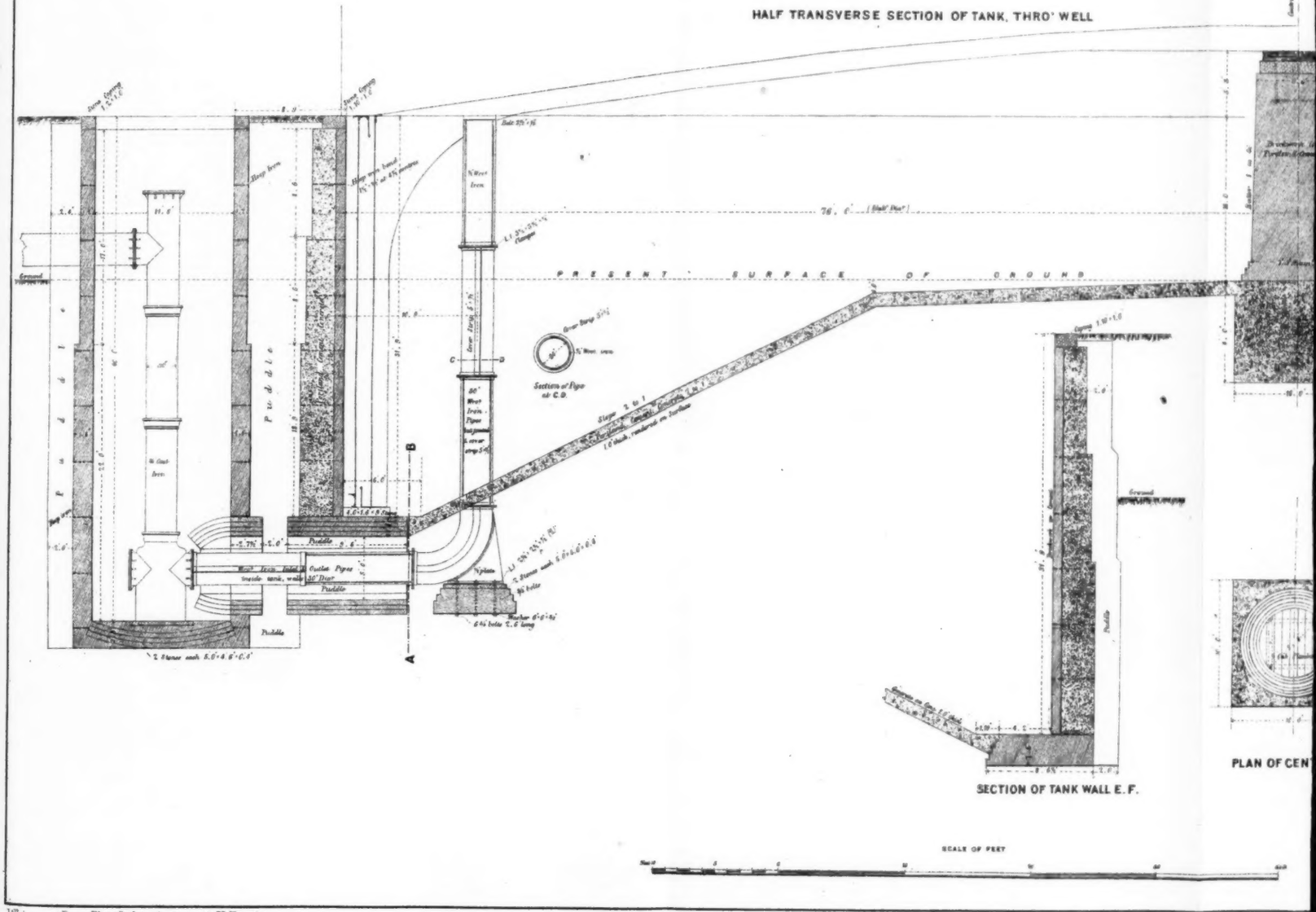
The application of the screw or spiral rake is one of the novel features in this apparatus, and the advantage claimed for it is that it effectually breaks up the coke in the retort, and allows it to be drawn out freely at one operation. A rake-head of the common form may be attached to the end of the spiral rake to better adapt the machine to the drawing or discharging of D-shaped or oval retorts.

WHITEHAVEN OLD GAS COMPANY.—The ordinary general meeting of the shareholders of this company was held on Monday, the 17th inst., at the offices, Bransty—W. Wilson, Esq., chairman of the directors, presiding. The accounts for the year were read to the meeting, and a dividend of 10 per cent. declared. Messrs. John Wilson and John Asken were re-elected directors. The manager, Mr. Studholme, was much congratulated by the shareholders in being able to pay so satisfactory a dividend, and received a vote of thanks for his services.

NEWCASTLE & GATESHEAD GAS COMPAN

REDHEUGH WORKS.

TANK 152.0 DIAR & 31.9 DEEP.


HALF TRANSVERSE SECTION OF TANK, THRO' WELL
PRESENT SURFACE OF GROUND
Puddle
Section of Pipe at C.D.
SECTION OF TANK WALL E. F.
PLAN OF CEN
SCALE OF FEET

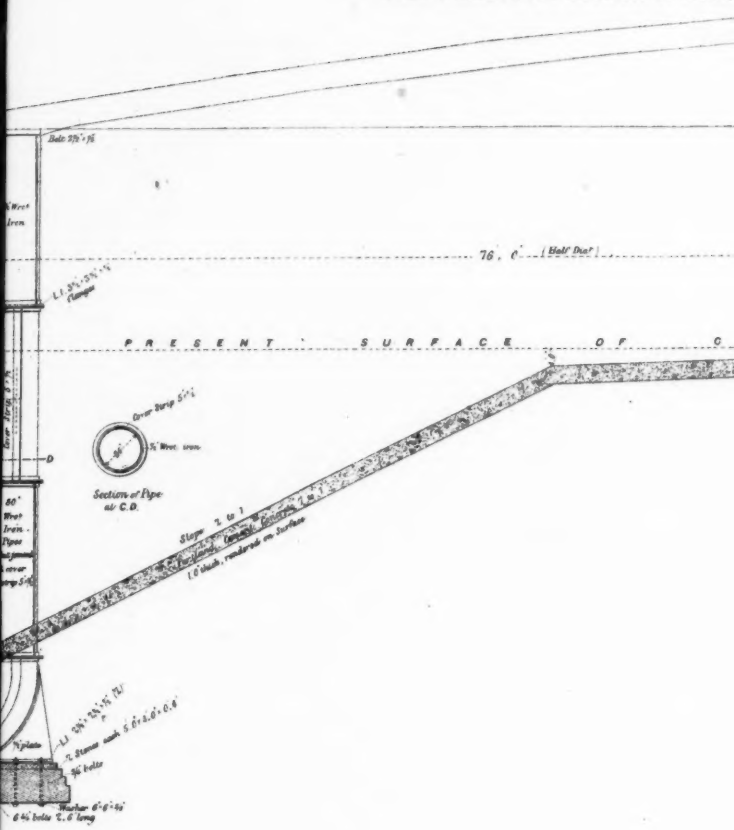
Whiteman & Bass, Photo Litho to the Queen, 236 Holborn.

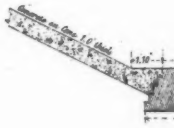
NEWCASTLE & GATESH

REDHEUGH

TANK 152.0 DIA

HALF TRANSVERSE SECTION OF TANK,





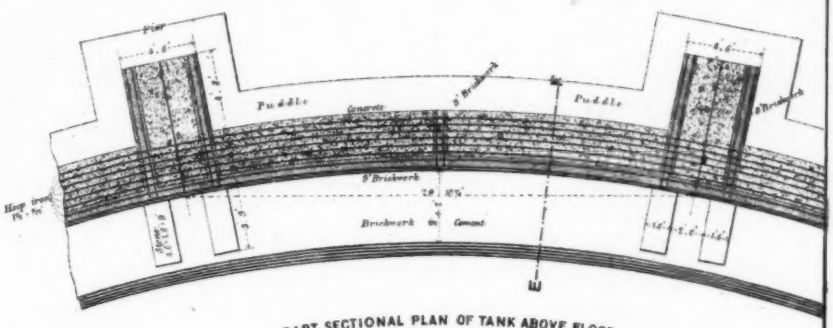
SECTI

SCALE OF FEET

ATESHEAD GAS COMPANY.

EUGH WORKS.

2.0 DIAR & 31. 9 DEEP.

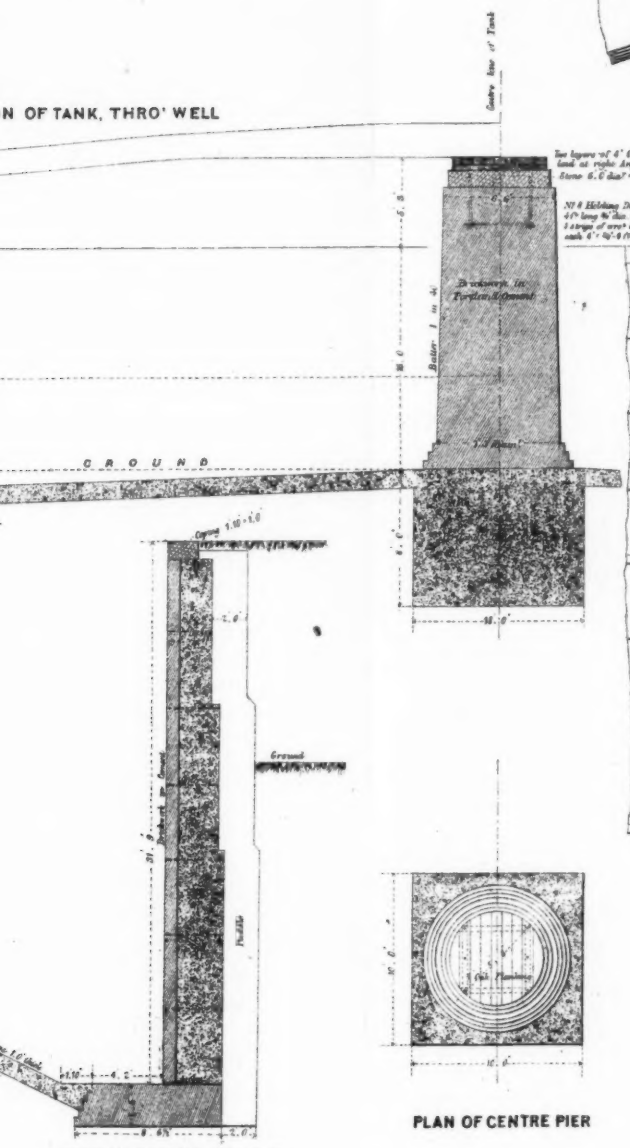


PART SECTIONAL PLAN OF TANK ABOVE FLOOR

Shewing Heap iron bond

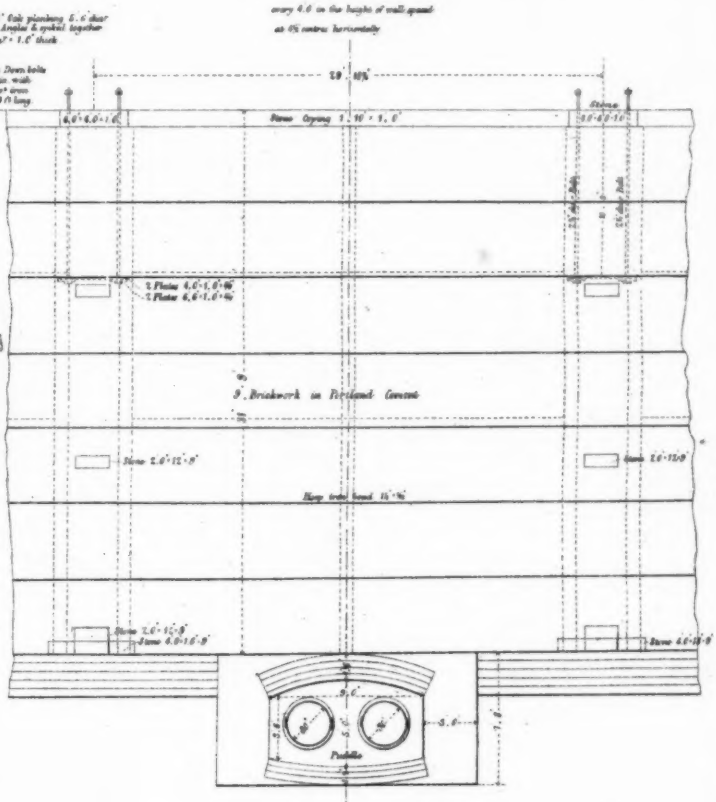
NOTE. The heap iron 1½" × ⅝" at about every 4.0 in the height of wall spaced at 6% centres horizontally

N OF TANK, THRO' WELL



SECTION OF TANK WALL E. F.

PLAN OF CENTRE PIER

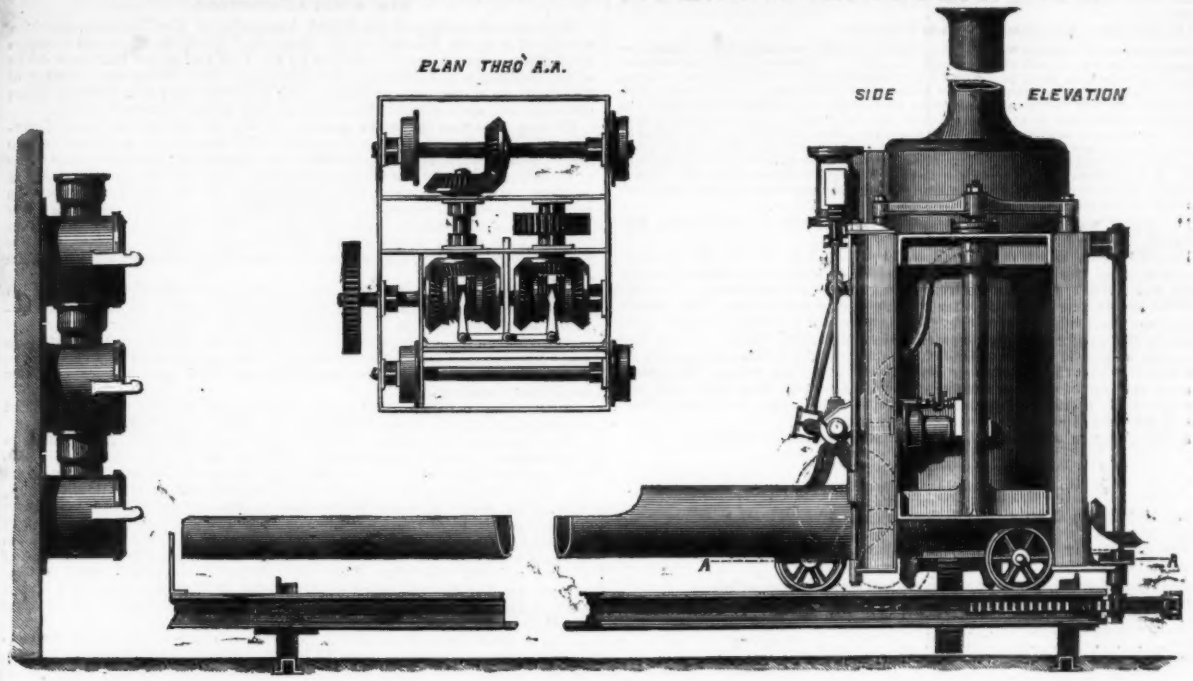


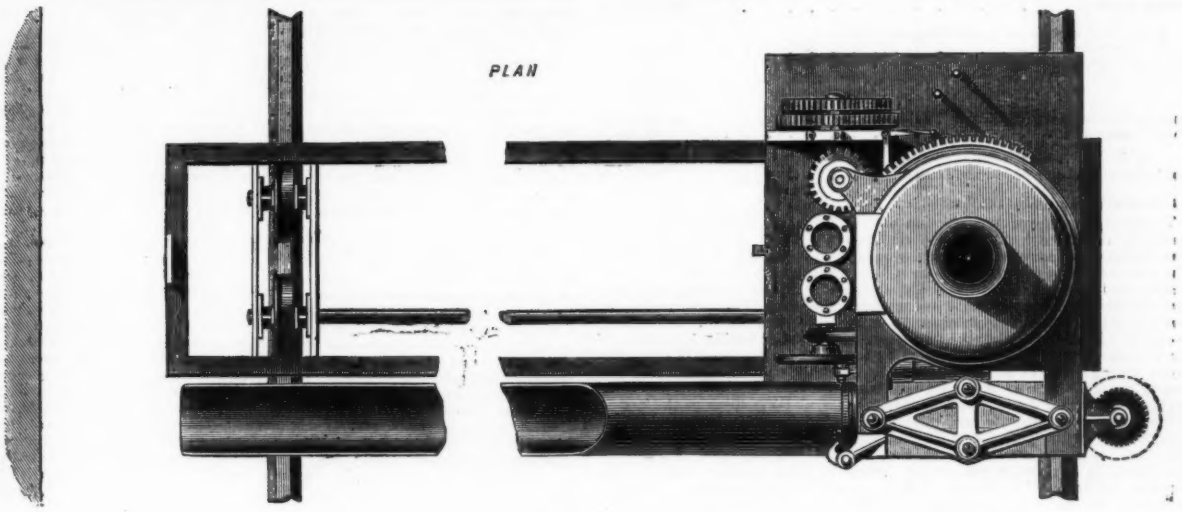
SECTION ON LINE

A. B.

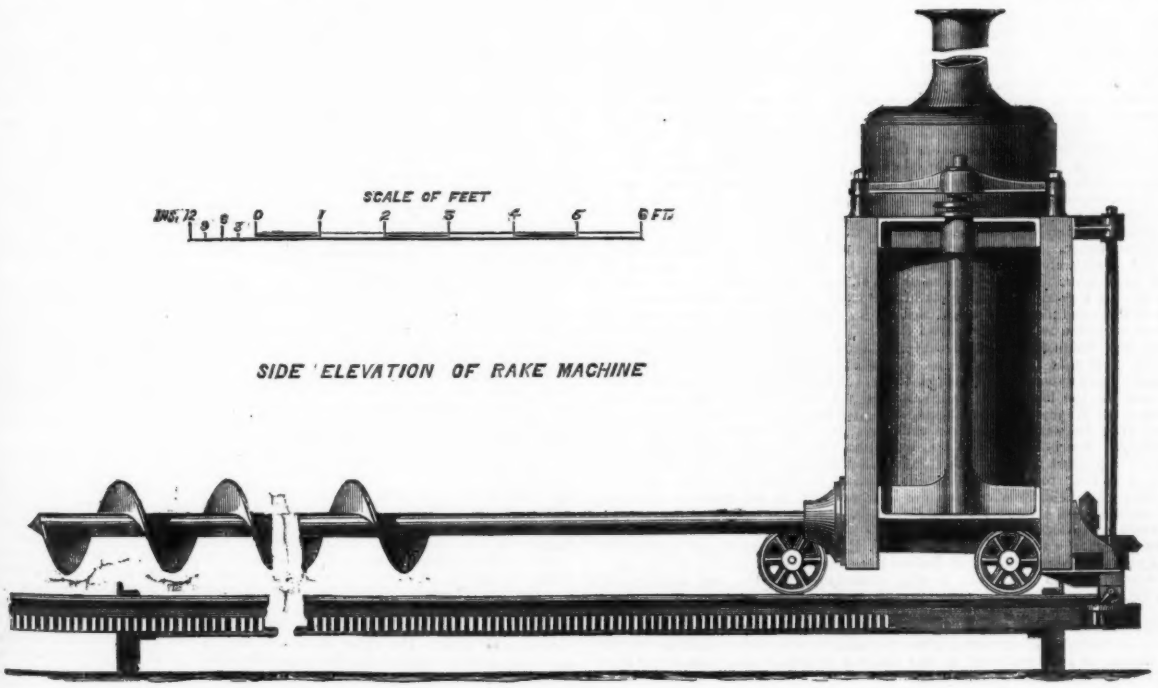
SCALE OF FEET

DARLINGTON AND SCOTT'S MACHINERY FOR CHARGING AND DISCHARGING GAS-RETORTS.





SIDE ELEVATION OF RAKE MACHINE



SHREWSBURY WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on the 18th inst.—Mr. G. M. Salt in the chair.

The directors report presented was as follows:—

The statement of accounts warrants the directors in again recommending a dividend for the past half year at the rate of £5 per cent. per annum. At the request of the corporation, the directors, on being guaranteed a net annual rental of £25, agreed to lay down the necessary mains for supplying the residents at Ditherington with water. The guaranteed sum will not be equivalent to the per centage on the expenditure which the company are authorized by the Act to require, but the district is so poor, and the need of the water (from a sanitary point of view) so urgent, that the directors felt justified in treating the case as exceptional. In consequence of the expenditure thus incurred, it is not proposed to make any addition to the reserve-fund out of the profits of the last half year. The directors have to regret the loss of their late assistant clerk, Mr. Robert Williams, whose energy and regularity have been highly appreciated by the board and secretary during the last six years.

The report was adopted, and a dividend at the rate of 5 per cent. was declared.

The Chairman said there was one matter to which he should like to refer. In the report of the Sanitary Committee presented to the corporation that day week, and which appeared in the local papers, there was a statement to the effect that the streets were watered as often as the supply would permit. This remark would lead the public to think that the company did not supply an adequate quantity of water for flushing purposes, and he thought it necessary to say that there was no ground for this statement. He had spoken to the turntap, and he had told him that there was never any difficulty in getting water. The custom was for the inspector to give notice the day before, and then the water was always ready. He thought it would be better to write a letter to the town-clerk, but he wished to make the statement he had publicly.

A vote of thanks was passed to the chairman, and the meeting ended.

LEICESTER WATER-WORKS COMPANY.

The Half-Yearly Meeting was held on the 17th inst.—Mr. E. S. Ellis in the chair.

The Secretary (Mr. J. H. Williams) read the following report of the directors:—

Your directors have to report that during the half year the gross receipts amounted to			£9,618 0 0
From which deduct:—			
Working expenses	£1,773 4 6		
Rates	432 4 6		
Interest	1,138 12 2		
		3,344 1 2	
Leaving net profit			£6,273 19 6
Apportioned as required by the Company's Acts:—			
To the shareholders			£5,536 19 9
To the Local Board of Health			736 19 9
			£6,273 19 6
From the shareholders proportion			£5,536 19 9
Deduct income-tax			69 14 2
			£5,467 5 7
Add balance from last half year and interest			401 16 0
Will leave at the disposal of the shareholders			£5,869 1 7

The Chairman moved the adoption of the report, and observed that, comparing the revenue account with the corresponding period of 1873, they found that the receipts had increased by the sum of £310, being £9618 against £9308. The working charges had increased in a larger ratio; they were £1773 against £1484, the principal increase being in the cost of repairs of works, and that increase arose to a considerable extent from the cost, fairly chargeable to revenue, of laying a new main from the High Cross down to the Welford Road to supply the Midland Railway at Wigston. Some other trifling alteration in the accounts left the net balance only about £33 or £34 more than in the corresponding period of last year. The dividend which they proposed to declare was at the same rate as at the corresponding period, 5½ per cent.; and after paying over to the Local Board of Health £737 as their share of the profits of the half year, the balance carried forward was the same amount as last half year, within, he thought, £24, or £369 against £393. He mentioned, he thought, last time, as stated in the report, that it would be necessary to apply to Parliament in the coming session for powers to raise further capital. The directors had not yet had the subject fully under consideration as to the amount to be called up, and other conditions; but at the proper time, as stated in the report, the shareholders would be called together to consider what propositions the directors might make to them. They would not require any very large amount of capital for many years to come; but from the necessity which existed from time to time of extending the works into new streets in the town, and also possibly into some of the villages adjoining the town, which they had power to supply, they would every half year require some further additional outlay of capital to a moderate extent. The rainfall during the last seven months of the year, up to the end of July, they would not be surprised to hear had been exceedingly small. He did not know that they had had another similar experience since the formation of the company. The fall at Thornton during the seven months to July 31 had been 7·39 inches, and at Bradgate a trifle more, 7·8 inches; the average being, therefore, a little more than 7½ inches, or not much more than an inch per month. As they knew, a great many towns in the kingdom had been suffering for want of water; but Leicester happily had not been in that condition, as they had an anbundant supply. He regretted, however, to acknowledge that for a few days only the quality of the water appeared not to have been quite so good as it should have been. He happened to be out of town at the time, but he understood that in a good many districts of the town there were complaints of the state of the water; and he would assure the shareholders this arose from no want of attention to the filtering of the water, but entirely from atmospheric causes, over which they had no control. They would all of them know, he believed, that that fault of the water had discontinued, and it was now as satisfactory as anybody could wish it to be. Before he sat down he could not but refer to the loss they had sustained by the death of his friend and colleague for 27 years on that board, Mr. Richard Harris. During the whole of that time he was an agreeable colleague, and they worked together very pleasantly. He believed with one exception they were the only remaining directors appointed under the Act, and the last time he saw him was at his left hand in that room, occupying his position as deputy-chairman. He was sure they all felt his loss very much. He was glad to say that the directors that morning had elected his son, Mr. G. S. Harris, to a seat at the board; he having consented to act as a director.

The motion was seconded by Mr. W. H. Ellis, and carried, and a dividend at the rate of 5½ per cent., free of income-tax, was declared payable on Sept. 1.

A vote of thanks was given to the chairman, directors, and auditors, for their valuable services.

Forfar Gas Commission.—At the meeting of the commission on the 12th inst., a statement was submitted of the probable income and expenditure for the year ending in June next, and it was resolved to reduce the price of gas from 7s. 1d. to 6s. 8d. for the current year.

NEWCASTLE AND GATESHEAD GAS COMPANY.

NEW WORKS AT REDHEUGH.

At the recent meeting of the British Association of Gas Managers, attention was directed by Mr. Woodall, in his paper on "Gasholders," to the drawings of a holder, now in course of erection by Mr. V. Wyatt at the Redheugh works of the Newcastle and Gateshead Gas Company. With the present number of the Journal we present our readers with a reduced copy of the first of those drawings, and shall complete the series as early as our space will permit.

We may state that the works contemplated at present and in course of construction at Redheugh, for the Newcastle Gas Company, are as follows:—Two retort-houses, each 240 feet by 90 feet, inside dimensions, for a total make of gas of 3½ million cubic feet per diem; a purifying-house, 194 feet by 70 feet, for 12 purifiers, each 24 feet square, with exhauster, boiler, and meter-house, and the necessary plant, &c., corresponding to the above make of gas per diem. The gasholders, of one million cubic feet each, will be added on to the works from time to time as the wants of the district are developed. One of these is now in course of construction, after the drawings now being published in the Journal.

The situation of the works is on the Gateshead side of the Tyne, and is almost surrounded by the branches of the North-Eastern Railway, communicating with which will be branch viaducts to the high levels of the retort-houses for the coal supply, and the low level lines of railway to the coke-holes of the retort-houses and other buildings. There will also be a quay upon the river Tyne, which will be connected with the works generally by other low level lines of railway.

It is estimated that at some future time the make of gas on the Gateshead site at Redheugh will amount to 6½ million cubic feet per diem.

The diameter of the tank of the holder now being constructed, and which is to be completed during the current year, is 152 feet between the walls, and it is 31 feet 9 inches deep from the floor to the top of the coping. The tank is constructed of the best hard-burnt bricks, in Portland cement morter laid English bond, grouted up solidly at every course, and pointed up neatly. At every 4 feet 6 inches in height of the walls there is hoop-iron bond in the proportion of one strip to each 4½ inches in thickness of walls, one-twelfth of an inch thick, 1½ inch wide, and well tarred and sanded. It is lapped over 2 inches, and riveted up with two ¾-inch diameter rivets at each point, formed in continuous lengths for the entire circumference of tank and well, and passed through the concrete pockets of the piers and walls, being intersected by other bands of hoop iron as shown on plans.

The walls of the tank are of the following dimensions, including the concrete tacking:—Footings to piers, 13 feet 2½ inches by 4 feet 6 inches; breadth at wall-panels, 8 foot 6½ inches; depth of footings, 2 feet 6 inches. The walls, from the top of the footings for a height of 13 feet 9 inches, are 3 feet 4½ inches thick; the next 8 feet 6 inches they are 3 feet thick; and the next 8 feet 6 inches they are 2 feet 8 inches thick to the underside of the coping.

The piers, 16 in number, at 29 feet 10½ inches centres round the inner circumference of the tank are 8 feet by 4 feet 6 inches, formed of 9-inch walls on three sides, and filled with Portland cement concrete. In each of the piers the holding-down plates and bolts hereafter described are built.

The contract provided that the whole of the mortar employed in the construction should be composed of one part of Portland cement, from a first-class maker, to three parts of sand measured dry and net, the cement to weigh not less than 112 lbs. per imperial bushel, and to be tested from time to time by those in charge of the work for cohesive strength and setting properties. The cohesive strength in the pure cement was to be of more than 200 lbs. per square inch after seven days immersion in water, and 500 lbs. after one year's immersion.

The contract also provided that the whole of the concrete should be composed of one part of Portland cement as above, and seven parts of gravel measured dry and net, the gravel to be composed of four parts of coarse screened stones up to one and a half inch diameter, and three parts of sand; the materials to be mixed dry first on a platform, then watered from a watering-pot with only sufficient water to moisten the same, then turned over twice thrown from an elevation into its place, and levelled off. The concrete to the pockets of the piers and walls of the tank was to be deposited in 9-inch layers not exceeding 2 feet 3 inches in depth each day, and then levelled off and grouted. The puddle throughout was to be 2 feet thick at least, and to be well worked up, turned over three times, chopped up with tools, well watered and passed through a pug-mill driven by engine power before being used. It was then to be thrown into place from an elevation, and trodden in 9-inch layers uniformly at the back of the walls, each layer to be chopped into the preceding one, which was to be kept clean. A large quantity of puddle was required to be in course of preparation at one time, so as to ensure sufficient working and tempering to same.

On the floor of the tank and under each post of the holders there are two stones, each 4 feet by 1 foot 6 inches by 9 inches. There are three stones, each 2 feet by 1 foot by 9 inches, built in the tank walls to the vertical line of each of the guides, at the positions shown on the drawings, having two holes in each to receive two 1¼-inch diameter bolts. The coping stones are 1 foot 10 inches in section, in stones 3 feet long, and worked truly to the radius of the tank. A stone 6 feet in diameter and 1 foot thick is placed on the top of the centre pier on the cone, which has 8¾ inches diameter bolts, 4 feet long, through the same. The stones under the standard to the framing are each 8 feet by 4 feet by 1 foot. The coping to the walls is 1 foot 2 inches by 1 foot in stones 3 feet long, worked to the radius of the same. There are two 4-inch landings under the inlet and outlet pipes in the well, of an area of 5 feet by 4 feet 6 inches each, and two 4-inch ditto, 5 feet by 4 feet each, under the pipes in the tank, placed in pairs, and jointed to each other. The whole of the stone, except the landings, are of best Yorkshire stone, or stone equal thereto, of sound quality, dressed and fair-tooled to beds, joints, and surfaces, and are laid on the natural bed on a thin layer of cement without packing.

The well to the tank for the inlet and outlet pipes is 11 feet in diameter inside and 40 feet deep to the floor of the same. The platform at the bottom is 2 feet 3 inches thick, with a 1 foot 2 inch invert formed therein. The first 22 feet of the wall above the floor is 1 foot 6 inches thick, and the next 17 feet, to the underside of the coping, is 1 foot 2 inches thick. Leading from the bottom of the well to the interior of the back there is an arched chamber 9 feet wide, 5 feet high, and 14 feet 1½ inch long, from the inside of the wall of the well, arched 18 inches thick, the side walls being 3 feet thick, and inverted with an arch 1 foot 2 inches thick. The whole is rendered on the inside faces of the walls with a coating of Portland cement ¾-inch thick.

There is a brick pier, on concrete, on the centre of the cone. The concrete foundation of the pier is 10 feet square and 8 feet deep. On this foundation the circular pier is erected, having a diameter at the top of 6 feet 6 inches, and batter sides of 1 in 40. At the level of 2 feet 9 inches below the top of the gasholder dome is the stone previously described, 6 feet in diameter and 1 foot thick. On this stone is a double layer of 4-inch oak planking, formed of planks spiked together, about 7 inches wide, of an area of 5 feet 6 inches diameter, and laid at right angles to each other. Into the pier, from the top of the planking, there is built eight ¾-inch diameter holding-down bolts, 4 feet long, with proper nuts and washers, which are held in the brickwork at the bottom by four strips of wrought iron, each 4 feet by 4 inches by ¾ inch, intersecting each other. The upper surface of the planking is faced and wrought to a true level to receive the bearing-plate attached to the underside of the rafters, which planking was thoroughly tarred twice before being placed in

position. The cone being dressed off to the form shown in the drawings, there was placed over the entire area of the same 1 foot of concrete in Portland cement.

The quantities, as taken out for the purpose of the tenders, were as follows:—9487 cubic yards of excavation and depositing on site, 1891 cubic yards of puddle, 1153 cubic yards of brickwork in Portland cement, 2134 cubic yards of concrete in Portland cement, 1622 cubic feet of stone (Ashlar), 20 cubic feet of oak; 7 tons of hoop iron, provided and built in brickwork and concrete; and 30 tons of iron, fixed only.

ANTHRACENE AND ALIZARINE.

By FREDERICK VERSMANN, Ph.D.*

(*Continued from page* 235)

Looking at the difference in distilling tar and pitch, it will readily be understood that the result must be somewhat different; in the first case the impurities are chiefly those hydrocarbons which pass over before the anthracene, and which have a lower melting point, while in the second case the hydrocarbons form the principal impurities. At first a great dislike, not to say prejudice, was created against the anthracene made from pitch, and with apparent reason, very likely because the buyers did not recognize the difference in the impurities, which of course necessitated a different treatment in the purification, and consequently the consumers did not succeed to their satisfaction in converting it into anthrachinon. However, all these difficulties have gradually been overcome; it has been satisfactorily demonstrated that this kind of anthracene, properly purified, is identical with that obtained from tar, that it can just as easily be converted into anthrachinon and alizarine, of both of which I have samples on the table, and the highly purified products of the Anthracene Company, Limited, who work our patent, are beginning to find universal favour with the intelligent alizarine makers.

The separation of anthracene from pitch is most important, because the yield is thereby greatly increased; tar alone gives about a half per cent. of pure anthracene, while tar and pitch give at least 2 per cent.

The crude anthracene obtained from pitch is treated somewhat similarly to the tar anthracene. The oil is allowed to stand for some time; it is then filtered, pressed, hydraulic pressed, and treated with suitable solvents to remove most of the impurities, and there is no difficulty whatever in thus obtaining an article containing 70 per cent. and more of pure anthracene.

The residue in the retort is a valuable coke, which is free from sulphur and phosphorus, and nearly free from mineral substances, containing about 99 per cent. of carbon, and having an intense heating power; I need scarcely say it is vastly superior to the ordinary gas coke, which contains all the mineral impurities of the coal in a concentrated form. There are several other patents in reference to the manufacture and purification of anthracene—Clark, Lucas, Caspers, and others—which I need not further notice.

None of the natural pitch or bitumen deposits seem to yield anthracene. I have myself tried Val de Travers, Trinidad, and several other of these deposits, without getting any hydrocarbon of this series. We must at present, therefore, look to the coal tar as our only starting point.

The yield of anthracene depends somewhat upon the quality of coal, and certainly also upon the degree of heat to which the coal has been exposed in the gas manufacture. Thus it is generally assumed that Scotch coals yield little anthracene, while South Staffordshire coal is rich in anthracene.

Pure anthracene crystallizes in rhomboidal plates, which melt at 213° C. to a clear colourless liquid; it distils at about 360° C. Nearly pure anthracene may be obtained by melting a partially purified sample in a retort, and passing a strong current of air through it, when the anthracene is carried off, and may be collected in the shape of brilliant flakes, or it may also be purified by sublimation.

I have determined the solubility of pure anthracene in alcohol of different specific gravity, and also in some other solvents, and the result is as follows:—

	Per Cent. Anthracene at 15° C. By Volume.	By Weight.
Alcohol, 800	·472	·591
Do. 825	·424	·574
Do. 830	·408	·491
Do. 835	·397	·475
Do. 840	·387	·460
Do. 850	·360	·423
Ether	·858	1·175
Chloroform	2·587	1·736
Bisulphide of carbon	1·180	1·478
Glacial acetic acid	·472	·444
Benzol	1·470	1·661
Petroleum	·291	·394

Having thus obtained the anthracene by one method or the other in a saleable form, we may next consider the method of determining its marketable value; and here I come to the most unsatisfactory part of the whole subject, a part which I am anxious to thoroughly ventilate.

In other commercial analyses the result obtained by the chemist, in almost all cases, is expressed in per centage of a definite, pure, chemical compound, from which, by simple calculation, the real and exact value of the merchandise is ascertained; no room is left for manipulating the analysis or for introducing modifications by which the result is affected. This is unfortunately not the case with the anthracene tests. I have already drawn attention to the difficulty the manufacturer has to contend with in separating the one hydrocarbon from the whole series, and if this is the case on the large scale, the difficulties no doubt increase with a laboratory experiment, and the chance of really trustworthy quantitative determination becomes almost hopeless. I repeat, the impurities which influence the value of the article are in all their physical properties so similar to anthracene itself, that it is impossible to effect a complete separation, either by solution, sublimation, or other mechanical means; nor do we know, as yet, of a convenient and entirely satisfactory process by which anthracene might be converted into a definite and distinct chemical compound, different from analogous products obtained from the impurities.

A short account of the usual anthracene tests will bear out my opinion. The first few parcels of anthracene were sold without any analysis whatever, and perhaps neither buyer nor seller knew what kind of bargain he had made, but soon the German alizarine makers looked up the tar distillers all over the country, and it became necessary to adopt some kind of test for determining the quality and value of this new product.

Dr. Gossert, of Elberfeld, in first introducing the alcohol test, was guided by the just opinion that the commercial value of a sample might be ascertained with sufficient accuracy by determining the per centage of hydrocarbons insoluble in alcohol, together with its melting and solidifying point. The details of the test are as follows:—

Alcohol Test.

Take 20 grammes of the well-mixed sample, heat it in a beaker glass with 150 per cent. of alcohol, sp. gr. ·825, till it gently boils; then cool it to 15° C. (59° F.), bring it on a filter, and wash with so much alcohol that the filtrate measures 400 per cent. Dry the filter and residue in a water-bath, detach the residue from the filter and weigh; the weight multiplied by 5 gives the per centage. Mix the weighed residue well in a mortar, and introduce a small quantity into a narrow glass tube, about 4 inches long and 1-16th internal diameter, and drawn to a point at one end; fix the tube and a delicate thermometer into a small paraffin or ozokerit bath, which heat gently and gradually. Note the moment the anthracene becomes liquid—*i.e.*, when the first drop collects at the end of the tube—this is the melting point. Now increase the temperature to about 220° C., remove the flame, and note the moment the liquid becomes solid again; this is the solidifying point, which, with good samples, should be nearly the same as the melting point; the mean of the two is the final point.

Now, we know pure anthracene melts and solidifies at 213° C., and in order to make the test really accurate, the per centage of insoluble should be of such quality as to melt exactly at that temperature; but even then it might not be pure anthracene, because some of the impurities have a lower and others a higher melting point, and a mixture of the two might melt at 213° C. This, however, is a question which need not be considered, because such a mixture would show a wide difference in the melting and the solidifying point, while with a pure definite compound they should be very nearly the same. The determination of the melting point altogether is an operation demanding great attention. First of all, a very delicate thermometer is required, and none should be used without previous comparison with a standard thermometer; very few instruments are so exact as not to require a correction, sometimes of several degrees, both in the rise and fall of the mercury. Then, again, the melting point of these hydrocarbons, especially in small quantities, often varies in like manner as that of sulphur, consequent to a change in the condition they have assumed by previous melting, more or less strong heating, or more or less rapid cooling.

But, nevertheless, although the alcohol test cannot claim anything like analytical accuracy, it may form a guide in fixing the approximate value of the article, provided the details of the test always remain the same.

The true melting point of 213° C. was never insisted upon, but its maximum was first fixed at 200° C. Competition soon lowered it to 195° C., at which it now stands—*i.e.*, the present alcohol test means the determination of per cent. of insoluble in alcohol, having a melting point of at least 190° C.

Of course, everybody knows that is not pure anthracene; still the test might be sufficiently accurate for comparative experiment, if always carried out in the same manner.

But now mercantile speculation and cleverness step in and suggest trifling modification for their own benefit. Knowing that the less anhydrous the alcohol is, the less it will dissolve, or, in other words, the higher the per centage of insoluble will be, several ingenious people have their test made with alcohol of 830 or 835, or sometimes even of 840 sp. gr.

Again, an impure sample may have a melting point much below 190° C. Then the chemist is often expected to take, not the actual proportion of alcohol, but an indefinite quantity, sufficient to bring up the melting point to 190° C.

In such cases the analyst is, of course, helpless; he has simply to follow the instructions he may receive, and any protest of his would perhaps have no other effect than the loss of a client.

The reason for using alcohol of half a dozen different specific gravities is obvious; the per centage of insoluble may thereby be increased or decreased. But such tricks and manipulations should not be tolerated; they throw doubt and confusion upon all transactions, and undermine the value of chemical analysis altogether.

Some time after the alcoholic test had been adopted, the bisulphide of carbon test was introduced, which is as follows:—

Bisulphide of Carbon Test.

Take 10 grammes of the well-mixed sample, place it in a wide-mouth stoppered bottle, together with 30 c.c. of bisulphide of carbon, shake up well and allow to stand for one hour at a temperature of 15° C. (59° F.); then bring the mixture on a filter, wash with 30 c.c. more bisulphide of carbon, and gently press the filter so as to dry it as much as possible; then dry completely in a water-bath, detach the residue from filter, and weigh; the weight multiplied by 10 gives the per centage. The melting and solidifying points are taken as above.

The principle of this test is so far the same as that of the alcohol test—viz., that the impurities are more soluble in the liquid than anthracene, and may thereby, partly at least, be removed. We find bisulphide of carbon much more active than alcohol, and on treating one and the same sample with both tests, alcohol invariably yields a higher per centage of insoluble with a lower melting point. There is no fixed relation between the two results. The product of the bisulphide test seldom has a melting test below 200° C., while with alcohol very few samples indeed show so high a melting point. The result of the bisulphide test is therefore much purer, and ought to fetch a higher price; but as no definite rule can be adopted, the constant mixing up of the two tests is another source of confusion.

I have tabulated a number of experiments with genuine commercial samples of various makers from different parts of the country; they are the result of 400 alcohol tests and of 250 bisulphide of carbon tests, and the deductions drawn from these figures strikingly show the difference of the two tests, and also the low quality of the product sold at present:—

Alcohol Tests of 400 *Commercial Samples.*

Melting Point.	Below 10 p.Ct.	10—20 p.Ct.	20—30 p.Ct.	30—40 p.Ct.	40—50 p.Ct.	50—60 p.Ct.	60—70 p.Ct.	70—80 p.Ct.	80—90 p.Ct.
Below 160° Cent.	—	1	—	1	—	1	—	—	—
160—170	—	—	1	—	1	1	—	—	—
170—180	—	2	4	3	3	—	—	—	—
180—185	—	1	11	16	3	2	1	—	—
185—190	—	7	21	30	20	18	5	—	—
190—195	—	24	35	48	51	21	13	2	—
195—200	2	9	6	10	5	6	5	2	1
Above 200	—	1	1	1	—	1	1	2	—
Total	2	45	79	109	83	50	25	6	1

Bisulphide of Carbon Tests of 250 *Commercial Samples.*

Melting Point.	Below 10 p. Ct.	10—20 p.C.	20—30 p.Ct.	30—40 p. Ct.	40—50 p. Ct.	50—60 p. Ct.	60—70 p. Ct.	70—80 p. Ct.
195—200° C.	—	2	1	—	—	2	—	—
200—205	4	13	16	12	9	4	—	—
205—210	5	24	47	35	6	—	4	—
210—215	2	11	32	8	4	—	—	—
215—218	5	—	—	—	2	—	—	2
Total	16	50	96	55	21	6	4	2

In summarizing these figures, we find, with the alcohol test, out of 400 samples—

47, or about 12 per cent., contain	less than 20 per cent. insoluble.		
79	20	from 20 to 30	〃 〃
109	27	from 30 to 40	〃 〃
83	21	from 40 to 50	〃 〃
50	12½	from 50 to 60	〃 〃
32	8	above 60	〃 〃

Again, as to the melting point, we find—

153, or about 38 per cent., melt	below 190° Cent.		
194	48	between 190 to 195° Cent.	
46	12	between 195 to 200	〃
7	2	above 200	〃

Looking at the bisulphide of carbon test, we find equally satisfactory results—viz., out of 250 samples—

16, or about 6 per cent., contain	less than 10 per cent. insoluble.		
50	20	from 10 to 20	〃 〃
96	38	from 20 to 30	〃 〃
55	22	from 30 to 40	〃 〃
21	8	from 40 to 50	〃 〃
12	5	above 50	〃 〃

Again, as to the melting point, we find—

5, or about 2 per cent.,	melt	between	195 to 200°	Cent.
58 "	23 "	"	between 200 to 205	"
121 "	48 "	"	between 204 to 210	"
57 "	23 "	"	between 210 to 215	"
9 "	4 "	"	between 215 to 218	"

I am indebted for these figures to my friend Mr. Manning, in whose laboratory these analyses have all been made in the course of last year; they fairly represent the quality of anthracene met with in the market at that time, and I do not think any sensible improvement has taken place since. Surely the manufacturer must soon find it to his own advantage to supply a higher class article.

With the alcohol test we have 80 per cent. containing less than 50 per cent. of insoluble, but only 2 per cent. of more than 70 per cent. of insoluble, which is the lowest quality the alizarine maker could use. Taking the melting point, we have 38 per cent. below 190° C., the lowest melting point at which the article is at all saleable, and only 2 per cent. above 200° C., which is not even the true melting point.

With the bisulphide of carbon test we have 94 per cent., with less than 50 per cent. of insoluble, and only 5 per cent. above that, while the melting point in all samples is much better, only 2 per cent. below 200° C., and 94 per cent. between 200 and 215° C.

To show the comparative value of the two tests, it was necessary to make a series of experiments with both alcohol and bisulphide, and the following list gives a few of such experiments. I have purposely selected a great variety, from the lowest to the highest quality, which will bring out several points most prominently. I have given the results in round numbers, omitting the decimals, both in per centage and temperature.

These 30 experiments represent samples varying with the alcohol test from 20 to over 70 per cent., with a melting point running from 154° to 211° C., while the bisulphide of carbon test varies from 5 to over 70 per cent., with a melting point of from 201° to 218° C.

The relative proportion between the two tests fluctuates with bewildering variety. With the low per centage the difference is as much as 4 to 1, with a vast difference in the melting point; but the higher the per centage the more uniform it becomes; nay, with the last sample the alcohol is actually lower than the bisulphide with nearly the same melting point—namely, 72·50 per cent., 211° C., against 74 per cent., 213° C.

Comparative Results of Alcohol and Bisulphide of Carbon Tests.

Alcohol. Per Cent.	Melting Point. Degs. C.	Bisulphide of Carbon. Per Cent.	Melting Point. Degs. C.
20	154	5	212
20	184	5	204
22	165	5	218
25	177	13	209
27	187	18	207
27	183	15	208
28	181	13	209
30	184	10	208
32	184	21	205
35	183	21	209
36	181	18	202
38	180	22	203
41	184	27	208
42	188	28	211
43	191	31	204
44	189	32	207
46	192	31	209
47	188	32	207
50	192	36	207
51	198	42	212
53	194	36	209
54	157	10	204
56	185	40	201
57	189	43	205
58	183	41	201
59	190	42	203
61	198	50	211
64	200	61	208
69	201	64	208
72·5	211	74	213

Looking at the melting point only in all these tables, the bisulphide of carbon series are the most reliable as approaching the quality of pure anthracene; the last table of alcohol test gives only one-third melting above 190° C., whilst the previous table gives about two-thirds, the rest being only indifferent.

If we want to compare the two tests, we can take only those alcohol samples which melt at or above 190° C. We then find the average proportion to be about 3 to 2, but as we know that the one product is much purer than the other, it must be clearly understood that it is so much more valuable, and no attempt should be made to simply substitute the one test for the other. However, under all circumstances, it will be desirable to improve the quality generally and to increase the per centage, especially by separating the oil as much as possible. But as long as this is not done, I would propose to wash the samples to be tested with light petroleum spirit, and to press and to dry them before using either alcohol or bisulphide; thus a more correct result will be obtained, and in case this should be adopted, more uniformity in the analysis would be insured. But, after all, these tests only give approximate results, and the want of a truly scientific treatment has long been felt. Now in producing alizarine from anthracene, the first step is to convert it into anthrachinon, and this reaction appears to be capable of adoption for analytical purposes.

(*To be continued.*)

RIVER WATER POLLUTION AND PURIFICATION.

The *Moniteur Scientifique* gives an interesting *résumé* of the investigation entered on by M. Gérardin, under the orders of the Minister of Public Instruction of France, in reference to river pollution, in terms analogous to those of the Rivers Pollution Commissioners of the United Kingdom. M. Gérardin, in the course of his investigations, examined the numerous watercourses embraced in the basin of the Croult, a river which falls into the Seine near St. Denis. The circumstances of the river are most favourable for the purposes of such an examination, considering that it includes causes of pollution from mineral, manufacturing, and other various sources of water impurity and corruption. The comparative examination of the various liquids proved that no criterion of really safe water for domestic use could be arrived at either in respect to colour, smell, or taste, nor even by chemical analysis. Turbid water might not be dangerous while that perfectly clear and without smell might be so. A healthy water, generally gave identical results on chemical analysis. In fact, there seems to be only one method of testing the salubrity of any water, and that is by observing its effects on living organisms. A water is healthy when animal and the higher class of vegetation can live in it; it is infected when it causes the death of all but infusorial animals and cryptogamous plants. The fact of finding fish in a river is a guarantee of the goodness of its water.

When the water undergoes a change for the worse, fish are seen to mount to the surface and choose places where purer water enters, and if they leave this they die. M. Gérardin cites several instances in which such phenomena were observed. He found, also, that aquatic plants were sensitive to the variation in the qualities of water; but that sensitiveness was unequal in its character. The most delicate test was that of cress (*cresson de fontaine*), whose presence showed that of excellent water. M. Gérardin cites instances in which such cress perished after a few hours, owing to the entrance into the stream of feculent matter. He describes various other water plants all more or less sensitive to the action of impure water. Among the most robust of such plants he instances the *Arundo phragmites*, which resists the action of the most impure water. Among animals the mollusc known as the *Physa bontinalis* only exists in very pure waters; the *Valvata piscinalis* in healthy water; others supported themselves in a medium quality; but no mollusc can live in absolutely impure water. Hence phanerogamous vegetables and molluscs indicate the different character of water in regard to purity; but infusoria, cryptogamic plants, and especially the algæ, afford also indication of the successive changes they undergo by impurification of the water. These inferior organisms survive after the disappearance of fish, molluscs, and green plants.

When the degeneration of the water is in progress, the river loses its limpidity, the water acquires an opaline appearance, and this colour resists filtration. The surface is covered with froth, and the water deposits a black matter fœtid to the smell, and disengaging bubbles of gas. Sulphides soon appear, which are evident by their action on silver vessels in kitchens near the bank, turning such vessels black. The water is then not only offensive to the taste, but is really poisonous. M. Gérardin cites the instance of a child who, accidentally falling into the water of a river of this class, died of poisoning.

Chemical analysis employed in the examination of the Croult water and its affluents showed the presence of a notable quantity of organic matter, but the artesian wells of St. Denis showed similar results, although the water was less unhealthy. A microscopical examination of the mud covering the bed of the river showed M. Gérardin some very reliable results. When he commenced his observations in September, 1868, the sugar and other works were commencing full operations. The Croult became covered with white froth, while the mud was black, very light in density, about one mètre thick, and covered with a thin white pellicle, which deposited itself on the surface of the stones, the water-sluices, weirs, &c. A microscopic examination showed that the white dirt or matter—consisted of the *Beggiatoa alba*, a species of shifting algæ. These cryptogamia remained until the month of March, when the season of carrying on the works ceased. After this period black masses rose to the surface of the water, which showed the same kind of algæ in a state of decomposition, and among them appeared another kind of algæ, the *Oscillaria natans*. This remained until the annual cleansing of the Croult and Rouillon, which takes place in the second week of June. After this cleansing the water ran black for several days, it then became clear, and the river was purified. But when the works began again in the middle of August, all the previous signs of impurity became evident.

The impurity of the Molette resembled that of the Croult, but its impurities were of a more special kind, owing to various manufacturing waste being cast into it. It had the characteristic fungus known as rat's-tail. Its water, at first clear and limpid, was loaded with putrescible matter as it passed from the works on its banks. The infusoria present indicated pollution by animal matter, while the white algæ indicated that by vegetable matter. In a portion of the water which was less impure, there were green algæ present. During the war of 1870, the banks of the Ourcq Canal having been broken by the enemy, the water ran into the Croult. Eventually the rivers were restored to their previous condition, but it was found that the *Beggiatoa* and *Oscillaria natans* were replaced by *Zygnema*, *Spirogyra*, &c.

In the course of his investigations M. Gérardin made a remarkable discovery. When a water retains a normal proportion of dissolved oxygen, the lives of fish and green plants are preserved, and so far it may be probably good. When the oxygen diminishes, those animals having the most active respiration first disappear, and subsequently those of lower respirative powers. This same cause influences the vitality of aquatic plants. A corrupted water is consequently one in which dissolved oxygen is absent; in notoriously bad water no dissolved oxygen is found. Consequently the sanitary condition of water employed for domestic purposes is intimately related to the presence or absence of dissolved oxygen, and the proportion of the presence of this gas in that form determines the hygienic state of the water.

The determination of such oxygen, by the methods hitherto adopted, has been both difficult and complicated, and inapplicable to liquids which so rapidly change their condition, even in closed vessels. It was necessary, therefore, to find a reagent which would allow of the instantaneous determination by means of a titrating liquid. For this purpose M. Gérardin employed hydrosulphite of soda. The amount of dissolved oxygen is determined by the discoloration through the titrating liquid added to the water, first coloured lightly by aniline blue. M. Gérardin thus relies on three methods of determining the amount of impurity of water—viz., 1st, observations on the higher classes of living plants and animals present therein; 2nd, the microscopic examination of infusoria and algæ; and, 3rd, the determination of the amount of dissolved oxygen present. These various methods he has amply tested in the laboratory by direct experiments in water purposely rendered impure by sewage, &c., with the same results as those already described in reference to the Croult.

M. Gérardin therefore concludes that organic matters in a state of decomposition deprive the water of its dissolved oxygen, and consequently render it impossible that either plants or animals of superior organization could live therein. Such matters reduce the sulphates, transform them into sulphides, and are the cause of the evolution of sulphuretted hydrogen. If the refuse water of manufactories be exposed to putrid fermentation in suitable tanks, aërating them on a large surface, the water may subsequently be allowed to flow into a river. By agitating the water it is made more readily to absorb oxygen, and by such a plan the fishers of Les Vosges are enabled to transport living trout in vessels of water constantly kept in lively action.

To purify water sent from factories M. Gérardin recommends that they should be spread over a surface of land previously well drained; but careful choice of the soil is requisite, as in a very sandy soil the liquid passes off without oxidation and injures adjacent vegetation, and poisons wells at some distance off. In his experiments he found that an argillaceous earth was most to be preferred, as shown by the results he obtained at Sonesse, where one of the manufactures has been the chief cause of the pollution of the Croult. At Bourget it was similarly attempted to purify the waste water of a factory; but this at first failed, from using too small a surface. On this being enlarged the result was successful. (In fact, the system M. Gérardin recommends is generally similar to that adopted in English irrigation sewage farms.)

In conclusion, M. Gérardin remarks that the causes of ill-health which result from the concentration of populations in towns and the multiplication of factories are more serious than is generally supposed; but, on the other hand, it is possible to remedy such evils. Consequently, nothing can excuse the supineness which leaves such dangers unabated; and it is the duty of the Legislature (in France) to avert the possible calamity of epidemics. The cost would be repaid a hundredfold in the consequent prosperity which would arise from the purification of the rivers, for human life would be lengthened, and a diminution of the average mortality be effected.

ROCHESTER GAS COMPANY.—The half-yearly meeting was held on Thursday, Aug. 13—Mr. J. Whittle, the chairman of the company, presiding. The secretary read the report and balance-sheet. The directors recommended the usual dividends—at the rate of 10 per cent. per annum on the old shares, and 7 per cent. per annum on the new shares. The report and accounts were received and adopted. A vote of thanks was given to the chairman and directors.

ECONOMY OF WATER.

By D. G. F. Macdonald, Esq., C.E., LL.D., J.P., &c.

"Herds and flocks drop the dry sprig,
And with imploring eyes ask man for drink."

We have, indeed, experienced a dry and hot summer, almost beyond precedent. The drought has been long, first attended with excessively sharp frosts, and afterwards with burning heat, such as I have experienced in the tropics. Verily the animals of the field have almost perished from thirst. Often and often again have I sorely grieved at the sufferings of poor sheep and cattle from the want of water, so much so, that I cannot resist writing a line or two upon the subject, in the hope of inducing landowners and farmers to husband for the hot months the rainfall of the preceding half year, so as to ensure an adequate supply for these poor unhappy animals, which are frequently shut up in enclosures where the ponds have become dry and the springs have vanished away. The clouds of heaven give us water enough from time to time, and doubtless we shall yet have our days of atmospheric darkness and long hours of rain, but we do not properly economize it—we wilfully throw it away—we waste and abuse it in the most heedless manner.

If water be the first necessary of life, the want of it must surely be a very serious and deplorable circumstance. It is a well-known fact that water is a large constituent of organic bodies, whether vegetable or animal. For instance, beef strongly pressed, yields nearly four-fifths of its weight of water; and a man weighing, say 160 lbs., if squeezed under an hydraulic press, would give 120 lbs. of water and only 40 lbs. of dry residue. Potatoes contain 75 per cent. of water by weight, and turnips no less than 90 per cent. Thus the living organism may be regarded as a mass diffused in water.

The general belief is that sheep drink but little, and that pasturage, however arid, will suffice for them. This is altogether a fallacy, as I have frequently proved by my own flocks. A sheep on dry food will consume at least a gallon of water per day, if freely within its reach. Moreover, experiments made in France have shown that a sheep cannot live beyond 14 days without water, that a horse may live 25 days without solid food, merely drinking water, and that he can live only five days when consuming solid food without drinking. After using solid aliment for ten days, with an insufficient quantity of water, the stomach becomes absolutely worn out. A horse which has been deprived of water for three days has been known to have drunk 11 gallons in three minutes. Such facts show, I think beyond all question, the importance of water in the sustenance of animals. I must, however, proceed to say a word or two on the economy of this precious fluid, which man and beast, bird and insect, so much depend upon for existence.

I am often laughed at when I assert that drainage prevents drought. It may seem startling, yet it is true. The better drained the land, the more loose and friable it becomes, and the more moisture it will hold. I have found over and over again that more water is held by a pulverized and open soil than by a compact and close one. Therefore the increased capacity of the soil to contain moisture is the greatest security against the withering effects of drought. Watery vapour is constantly rising from the surface of the earth in dry weather, and Sir Humphry Davy proved by experiment that 1000 lbs. of soil perfectly dried, upon exposure gained by absorption from the atmosphere, in a single hour, from 3 lbs. to 18 lbs. of water, the best soil gaining the most, and the worst the least.

It is, I think, essential for agriculturists, in the frugal management of water, that they lay out a system of drainage that shall fall in with nature and not oppose it. In many cases the fluid is not far to seek if a little mechanical skill were used. If care were taken, when draining farms, to have a drinking-place in every enclosure, supplied from the main channels connected where practicable with perennial springs, there would be abundance of water at all times for every description of stock. How lamentable, therefore, that so little attention is paid to what is so necessary to the health and comfort of the animals of the farm. I have often seen the poor creatures, after roving over burnt-up fields, compelled to drink out of abominable puddles, when the outlay of a very insignificant sum would place within their reach a constant supply of pure running water more grateful to them than the greenest pastures. In Scotland numerous small lakes and dams are kept up for the use of cattle in time of drought, and reservoirs for detaining and storing water are common on most farms. It were surely well that the agriculturists of Wales followed the good example of their more northern neighbours, and at once set about constructing dams, tanks, and reservoirs for a like purpose. The clouds shower down abundance. It certainly, therefore, is the fault of man that there is a scarcity of water at any time for the purpose of husbandry. Farmers and others have to blame themselves only, therefore, for the deficiency. Apart altogether from the question of inhumanity, I have always found a good supply of water tell most favourably on the dairy produce. Thus in an £. *s. d.* point of view the matter claims serious attention. Owing to the persistent drought this year, the earth became so parched, bronzed, and fissured, that nine out of ten of the common-constructed ponds became literally dry, to the great consternation and discomfort of herds and flocks. Now the chief cause is the absence of shade. I have often noticed that, while there was abundance of water in one pond, there was none in the other, although the soil was similar. The reason is that one was shaded and the other not, consequently the latter was soon evaporated by the heated glare of the sun burning upon it.

It may, perhaps, be unnecessary to remark that in constructing ponds it is of great moment to make them sufficiently deep, and to line them substantially and carefully with clay puddle. This I have invariably done. Whatever be the surface area, there should at least be a minimum depth of 8 feet or so at the shaded side. Moreover, a much larger quantity of water is economically stored up by every foot of additional depth. Depth, too, has the great advantage over wide or surface extent of losing in proportion by evaporation, and the water also keeps sweeter, and more palatable and wholesome both for man and beast.

The loss by evaporation in a hot season is quite astonishing when there is nothing to parry the noonday sun. A calculation was made a short time ago which showed that in 40 days the evaporation of an unprotected pond containing about 14,000 gallons of water was 9000 gallons—as much, in fact, as would have supplied a flock of hundreds of sheep for the time. This remarkable result is, I regret to say, discredited by many practical and scientific men who ought to know better; and pained indeed have I been to see farmers and others cutting away every branch, twig, and tree on the banks of ponds, thus causing great misery to the poor sheep and cattle during periods of excessive aridity, and when the delicious green swards no longer exist.

I would suggest to farmers and graziers to have the mouth or entrance to the pond, where practicable, on the north side, and protected from the sun on the south by fir trees, ash, evergreen shrubs, or other equally effective shelter; and, where water is scarce, to use any contrivance for raising it to the surface in time to meet the requirements of next year, and so spare the poor dumb animals of the field the dire horrors of extreme thirst.

I had as well remark that, when a pond has been constructed, it should be protected by some kind of fence or rail sufficient to allow the cattle to reach the water freely, but not to admit of their getting into it, as their droppings and stirring up the mud with their feet render the water unwholesome—in fact, almost poisonous. Moreover, every pond should have a kerb-stone to keep the soil and decayed vegetable matter from tumbling into it.

Everybody will admit that water is one of the prime needs of sustenance, comfort, health, and cleanliness. Nevertheless, all who have travelled in rural districts must have lamented the public waste of this precious gift, which has indeed reached a pitch of reckless prodigality. And how are we to reckon on seasons such as we have just had? It is acknowledged that they often repeat themselves; and if we have experienced a dry and hot summer this year it may not be wholly fanciful to expect a somewhat similar time soon again, if not, indeed, next year.

It is really deplorable that such a state of things should go on, and that we have the remedy in our own hands. The misery and suffering to the poor animals of the field is severe in the extreme; and I repeat that a scarcity of water is the sorest privation that man and beast can well endure. Surely, then, the present condition of matters is nothing short of a scandal and reproach to our civilization. *Spero meliora!—The Cambrian.*

THE COST OF GAS FIFTY YEARS AGO.

The following prospectus of the Edinburgh Oil Gaslight Company, and the regulations of the Leith Oil Gas Company, will be perused with interest. The prices, charged will astonish many to-day; but even at 40s. and 50s. per 1000 feet gas was comparatively very cheap. Condition No. 7 of the Leith Company may be recommended to the attention of coal gas companies now. It showed great knowledge and foresight on the part of the engineers or advisers of the company when they reserved to themselves the right to supply all the burners.

EDINBURGH OIL GAS LIGHT COMPANY.

(INCORPORATED BY ACT OF PARLIAMENT.)
1824.

SIR WALTER SCOTT, Bart., of Abbotsford, *Chairman.*
JAMES DUNDAS, of Dundas, *Deputy-Chairman.*

DIRECTORS.

Robert Brittain Blyth, Merchant.	George Dunlop, W.S.
John Waugh Brougham, Wine Merchant.	Wm. Hozier, of Newlands and Barrowfield.
James Gibson Craig, of Riccarton.	James Skene, of Rubislaw.
John Robinson, Secretary to the Royal Society.	Roger Aytoun, W.S.
	Colin M'Kenzie, of Portmore.
William Muir, Merchant.	William Clerk, Advocate.
John Corse Scott, of Sinton.	Warren Hastings Anderson, Merchant.
Peter Brown, Merchant.	
William M'Kenzie, W.S.	Alexander Wood, Advocate.
James M'Donald, Merchant.	John Bonar, Banker.
Miles Angus Fletcher, Advocate.	Alexander Craig, Merchant.
David Ramsay, W.S.	Alexander Greenhill, Advocate.

Roderick M'Kenzie, W.S., *Secretary.*

The Directors of this Company beg leave to announce to the Inhabitants of Edinburgh, that they will be ready early in November next, to supply them with a Light, which, for brilliancy, cleanliness, and economy, has not yet been equalled.

To suit the convenience of Customers, they have resolved to supply them with *Meters*, through which all the Gas passes, and is registered with the greatest accuracy. By this plan the Consumers can be charged for no more than the exact quantity consumed, whatever may be the number or description of lights employed by them. Neither are they limited in point of time, but may use the light for a longer or shorter period as best suits them, and may increase or diminish the quantity at pleasure.

To Bankers, Merchants, and Men of Business of every description, it is quite unnecessary to point out the great advantages of burning Oil Gas in their Offices. It not only saves the incessant trouble and numerous accidents that must inevitably occur from the ordinary mode of lighting with oil lamps and candles; but affords, at an expense comparatively trifling, a cleanly, clear, and steady light, particularly well adapted for Counting-Houses and Writing-Chambers.

Oil Gas is so perfectly pure, that it does not emit the slightest smell during combustion; has no tendency to corrode or stop up the pipes used to convey it; does not tarnish or injure polished metals, gilding, paint, pictures, books, or delicately coloured stuffs; causes less heat than the best constructed lamps in common use; and, in point of *economy*, as will be seen from the annexed statement, has greatly the advantage of any other mode of lighting.

Almost any building can be fitted up to receive it, at a very moderate expense, without inconvenience, and with perfect ease and safety; and all Chandeliers, Lamps, and Lustres of ordinary form, can be adapted to burn it, without the necessity of purchasing new ones for that purpose.

Oil Gas being thus, from its purity, equally adapted to be used in the finest furnished Apartments, as in Public Offices, Writing-Chambers, Shops, and Manufactories; and possessing such undeniable advantages in point of economy, the Directors feel confident that a trial is all that is wanted to render the use of it, in *Dwelling-Houses*, quite general in Edinburgh; and they are confirmed in this belief, by the numerous orders which they have already received for lighting the best houses in town.

The Directors recommend to those who intend to light with Gas during the ensuing season, to have their tubes and fittings prepared as early as possible, in order to secure good workmanship, and to avoid the disappointment which will probably be experienced by those who delay these operations to the time when the light is required. Every information on this subject will be obtained at the Company's Office, 34, St. Andrew's Square.

THOMAS DICK, *Manager.*

RATE OF CHARGE
BY THE
Edinburgh Oil Gas Light Company.

The Company have resolved to sell their Gas entirely by Meter, at the following rate:—

For the quantity of Gas registered by the Meter, 40s. per 1000 cubic feet.
For the use of a Meter, 8s. per annum.

N.B.—An argand burner, with ten holes, (giving a light equal to six candles,) consumes one foot of Oil Gas per hour, and, burning from dusk until nine o'clock, will cost 37s. 6d. per annum. A single jet burner consumes one-fourth of this quantity.

Comparative Statement of the Expense of equal quantities of Light from each of the following articles for 300 days, at 4 hours per day.

One Large Argand Burner with Oil Gas.	Tallow Candles, at 9d. per lb.	Wax Candles, at 3s. 6d. per lb.
£3 12 0	£10 2 6	£52 10 0

It is calculated that six cubic feet of Oil Gas will give a quantity of light equal to one pound of *Wax* Candles; and the Company propose to supply their Customers, with that quantity, at about one-third of the price of a pound of *Tallow* Candles.

The Customers will be at liberty to use any sort of burners they please; but for general use, the Directors would recommend the *argand burner*, with a French shaped chimney, which, by causing complete combustion, gives more light with an equal expenditure of gas, than any other. Burners of different

sizes, and on the best construction, will be supplied at the Company's Office when wanted.

REGULATIONS.

I. Payments to be made Quarterly, 2d February, 15th May, 2d August, and 11th November.

II. The Company's Inspector to be admitted during the day-time, upon due notice, to examine the meters and service pipes.

III. Any injury done to the meters to be reported at the Company's office.

IV. Customers requiring service pipes exceeding 20 feet, to lay the additional quantity at their own expense.

THOMAS DICK, *Manager.*

Office, 34, St. Andrew's Square.

CONDITIONS
ON WHICH
THE LEITH GAS LIGHT COMPANY
ENGAGE
TO SUPPLY THE PUBLIC WITH OIL GAS.

1. For every 100 Cube Feet registered on the Meter, the Consumer is to pay £0 5 0
2. For the Use of the Meter, quarterly on the Meter, the Consumer is to pay 0 2 0
   [This is one of the smallest size, and will be sufficient to register from one to nine argand burners.]
3. The Payments to be made on the 1st February, 1st May, 1st August, and 1st November, of such sums as shall be due on those respective days.
4. The Meter will be provided and kept in repair by the Company, so far as regards tear and wear; but should it be injured by inattention or want of care, the repairs must then be at the Expense of the Person using it, and such repairs to be done under the Company's Inspector.
5. The Company will lay the outer Service Pipes, and maintain the same at their Expense.
6. The Pipes and the Fittings-up in the Houses and Shops, to be put up and maintained at the Expense of the Consumer, but the work to be done under the superintendence of the Company's Engineers.
7. The Burners will be supplied by the Company only, and the Pipes and other interior Fittings, to be supplied by such Persons as their Engineers shall find qualified, and they shall be paid by the Consumer.
8. If any Reparations of the outer Pipes or inner Fittings should be necessary, the same shall, upon notice thereof, be done forthwith.
9. The Company's Inspector is to be allowed occasional access to such Premises as are supplied with Gas, for the purpose of ascertaining the quantity consumed, and the state of the Fittings.
10. The Consumer may discontinue the use of gas, on giving the Company One Month's Notice; and if payment is not regularly made, the supply to be withdrawn.
11. Where Argand Burners are adopted, it is recommended, on every occasion, that they be used with a Cylindrical Glass, and that the Flame should not exceed Two Inches in length, as the brilliancy of the Light is impaired with a longer Flame, and a greater quantity of Gas consumed than is necessary. In Jet or Thistle Burners, where no glass is necessary, the length of Flame should be the same.

All Persons requiring GAS from the LEITH GAS LIGHT COMPANY, will please to fill up and Sign the following Letter of application.

LEITH, 182

SIR,

As desirous of being supplied with GAS, *by the* LEITH GAS LIGHT COMPANY, *agreeably to the above Prices and Regulations, request you will cause the Service-Pipes to be laid to Premises, at and also give directions to to furnish the necessary Fittings therein.*

To Mr. WM. FORREST, MANAGER
For the LEITH GAS LIGHT COMPANY,
LEITH.

ON THE UTILIZATION OF AMMONIACAL LIQUOR IN SMALL GAS-WORKS.

Since the value of sulphate of ammonia has been recognized for agricultural purposes, all gas-works of a certain extent have erected plant for the production of this salt, and in such cases a profit has been obtained to the extent of above 1·5 francs (say 14½d.) per ton of coal when the works were of large size. But small gas-works have not yet participated in such advantages, their extent not being equal to the expense which would be incurred in the production of the salt, which, in such cases, has nearly equalled the price obtained for it. For this reason they have sold the liquor, and their receipts have consequently been of little value.

M. Chevalet, who for several years has been engaged in the production of ammoniacal salts, has arrived at an arrangement of plant suitable for all kinds of works. For small works it is an almost laboratory form of apparatus. It has the advantage above those employed in large works that the expense of fuel and labour becomes insignificant. Being small, it is easily placed in a corner—for example, in the purifying-room, where it prevents the frost entering during winter. It is also possible to carry out the manufacture during the whole of the year, the apparatus being capable of dealing with more than the daily production of liquor. The method of heating is that of using the waste heat of the ovens, or the simple and ordinary plan of evaporation.

If the producing power of the gas-works is lowered, the waste heat is less, at is also the work of the apparatus. It is also possible to furnish boiling water for general use in the works by means of the apparatus. The work is renewed by simply letting water into the boiler each 12 or 24 hours, according to the extent of the works, introducing the water when it is saturated with ammonia.

When the acid, which has been introduced into the leaden vessel, is saturated, the salt is withdrawn, and allowed to drain. This work does not require more than one hour's attention per day; the rest of the time there is nothing to do. Consequently, in small works, the cost of labour is insignificant, the total expense of manufacture is consequently reduced to that of the cost of the acid; and if the acid cost 8 francs (say 6s. 6d.) per 100 kilogrammes (or say 2 cwt.) the sulphate of ammonia affords from 10 to 12 francs (say from 8s. to 10s.) per 100 kilogrammes, including all incidental costs. As the sulphate sells at about 45 francs (say 36s.) per 100 kilogrammes, the profit is consequently 33 francs. Work, distilling 1000 tons of coal annually may produce 5000 kilogrammes of sulphate, showing a large profit. The apparatus is simple, cheap, easily arranged, and has already been adopted in many works about Paris, &c.—*Le Gaz.*

GAS COAL DISCOVERY IN FIFESHIRE.—Through the enterprise and energy of Mr. Thomas Lumsden, coalmaster, the field of coal known to exist near Peat Inn was thoroughly explored by boring during the last twelve months. Sinking operations and the erection of the buildings necessary for the engine, &c., about 100 yards off the public road eastwards, were completed the other week. The bed reached is over 4 feet in thickness, the underlying "splint" being an excellent strong coal, and the overlying gas coal yielding by test somewhere over 12,000 cubic feet of gas of a high illuminating power per ton, thus asserting a high rank as a gas producer. The black coal, which also will probably be worked by-and-by, is thought to lie about 13 fathoms under this seam.—*Dundee Advertiser.*

IRON AND COAL TRADES OF SHEFFIELD, SOUTH YORKSHIRE, AND NORTH DERBYSHIRE.

(FROM OUR OWN CORRESPONDENT.)

I am unable to report any material improvement in the general state of the local iron trade, but there does seem reason for hoping that we shall not have long to wait for an improved state of things. The brass-works and foundries are doing a good business, in fact, I may say that the leading local firm in the brass trade is utterly overwhelmed with orders—orders which cannot be executed in anything like reasonable time by reason of the lack of workmen. The house to which I refer is willing enough to satisfy all its customers, but cannot at present do so on this account, the demand for water, engine, and plumbers fittings being on a particularly large scale.

A good deal of interest has been excited in business circles here during the week by the publication in the local newspapers of the annual reports of several leading coal and iron companies—in one case, I believe, in a perfectly unauthorized manner.

It has thus transpired—and, of course, the information has so become public property—that the profits for the year of the Staveley Coal and Iron Company are not less than £263,921, making, with £23,000 odd from last year, £287,611 available for dividend; £60,000 are carried to the reserve-fund, and £32,111 to next year's account. The directors think that serious competition may be expected in the coal and iron trades, with the view of meeting which they are sinking several new pits, and are making every other possible effort to improve the position of the company.

The Industrial Coal and Iron Company pay 5 per cent., having expended upwards of £56,000 on dead work in the year. Messrs. Samuel Fox and Company, Limited, near Sheffield, have £67,655 available for dividend, out of which they pay 10 per cent., write off £36,000 of the sum payable for goodwill, and carry forward £7000, besides having paid off the balance of the purchase-money (£43,055) owing to the vendor.

The Sheepbridge Coal and Iron Company's net profit (as stated by a local newspaper) for the year is £120,784. The reserve-fund is increased by an addition of £50,000, making it £90,000. The total dividend for the year is 22½ per cent., leaving £10,000 to be carried forward.

In the coal trade, it was announced on Friday morning that the arbitrators, sitting in London, had awarded that the miners accept the further reduction of 2½ per cent., making altogether a drop of 12½ per cent. in their wages. This decision affects about 25,000 miners in the South Yorkshire and North Derbyshire districts.

It should be the means of causing a fall in the price of coal.

IRON AND COAL TRADES OF SOUTH STAFFORDSHIRE AND EAST WORCESTERSHIRE.

(FROM OUR OWN CORRESPONDENT.)

The inquiry for finished iron is still tolerably well sustained, and the condition of the trade, though far from active, is decidedly better than at the opening of the quarter; it is now generally conceded that the prospects of business are excellent, so soon as prices have reached the limit at which consumers can feel confidence in the market. The demand for sheets is especially good, consequently prices are firm, and the mills devoted to the production of this class of iron are all in steady operation; but, excepting galvanized sheets, which are in request on account of the colonial markets, the export trade is very dull, and merchants affirm that nothing like a healthy demand will be experienced until a further reduction of £2 per ton has been declared. For all descriptions of branded iron prices are firm, on the basis of £12 for bars, but the commoner unmarked qualities are greatly influenced by specifications, and makers are in some instances accepting orders which afford only the narrowest margin of profit in order that their mills may be kept running. Common bars have been freely offered at £10 10s.; hoops, £11 10s.; and sheets, £13. The last settlement of the wages question, whereby the finished ironworkers secured a rise in wages, is spoken of as operating to the disadvantage of employers in the present condition of the trade.

The pig iron trade, though slowly improving, is still much restricted by the competition of the North of England and South Wales districts, which are more favourably situated in respect of fuel and labour; two additional furnaces have been relighted within the last few days, raising the number now blowing to 52, but large stocks of pigs continue to be held. The ironfoundry and engineering establishments are now in active operation, and a good number of inquiries for gas and water pipes continue to be received. The Wallasley Water-Works Company are seeking tenders for the supply of a quantity of 12-inch main-pipes. The wrought tube and fitting makers report an improved demand, and they now anticipate a steady revival of business.

In the coal trade the supply is still considerably in excess of the demand, though the pits are only in partial operation, and the colliers manifest an anxiety to make as much time as masters can be induced to sanction. Prices are nominally unchanged, though there is much underselling going on among the non-associated masters. Good forge coal is easily procurable at 12s. per ton. In some parts of the district heavy stocks are accumulating, and while buyers are attempting to bring down quotations, there appears no disposition on the part of the trade to make any further concession.

An interesting trial of coal-cutting machines, under the auspices of the local Institute of Mining Engineers, took place at Dudley a few days ago, and although the result could not be pronounced as altogether successful, there is every reason to believe that, aided by the experience now gained, the machines will eventually be adapted to the requirements of the district.

IRON AND COAL TRADES OF LANCASHIRE.

(FROM OUR OWN CORRESPONDENT.)

Generally, in the coal trade, there has been some improvement during the past week. Prices are firmer, and there is not so much disposition to reduce quotations. Although there is still a disinclination amongst consumers to enter into large contracts for forward delivery, a good hand-to-mouth business is being done, and stocks continue low. In some of the best qualities of coal the little that had been put down is being filled up; but in the poorer descriptions stocks are accumulating, and in some cases the output of this class of fuel has been stopped. In the Tyldesley district the colliery proprietors are, as a rule, now disposing of all the coal they are raising, and the pit prices range about as under:—Best coal, 12s. 6d. per ton; furnace coal, 10s. 6d. per ton; burgy, 8s. 6d. to 9s.; and slack, 7s. 6d. to 8s. 6d. per ton. In the Wigan district trade is not quite so brisk, but the leading firms still maintain their past prices, although the delivery rates have been slightly reduced.

The coke trade continues dull, with prices irregular.

No settlement has yet been arrived at with regard to the wages question in West Lancashire, but an adjourned conference between representatives of the masters and the men is to be held this day (Tuesday) at Wigan. The masters seem determined to insist upon a reduction of 15 per cent., but the men seem only disposed to accept 10 per cent.

In the iron market there has been, if anything, a lull in the demand during the past week, but for foundry pig iron there has been a continued steady inquiry, and Middlesborough makes have been firm. For present delivery foundry iron is still scarce, and 81s. 3d. per ton has been paid for immediate delivery in the Manchester district. For delivery next month 78s. 9d. is an average quotation, and for No. 4 forge—for which, however, there is but little demand—about 68s. 9d.; whilst for delivery over one year 2s. 6d. per ton less on both descriptions of iron is accepted. In manufactured iron a fair demand

is maintained, and prices are firm, bars being worth from £9 15s. to £10 per ton, light rails about £10 2s., heavy ditto about £8 10s. per ton delivered.

The blast furnaces in South Lancashire continue fully employed, but the production, from some cause or other, is chiefly of the forge quality of iron. The furnaces in the North are still only moderately employed, as the demand for hematite is dull, and the prices offered by buyers are so low as not to encourage the production of this class of iron.

The forges continue well employed, and founders, engineers, and machinists are receiving more work. A good many orders for machinery have lately been received, and locomotive builders are very busy.

COAL AND GENERAL TRADE OF THE NORTH.

(FROM OUR OWN CORRESPONDENT.)

The coal trade of the North of England was firmer last week. There was a better inquiry for the best kinds of steam, gas, and households, and an improved shipment of small coals; but, with regard to the latter, coalowners state that two-thirds of what they are sending abroad is in steamers belonging to the collieries, and is upon consignment. Of course, for the next five or six weeks, merchants in the Baltic, and upon the Continent generally, will be anxious to make up their stocks for the winter, and steamers are hurrying away to the Mediterranean, taking coal cargoes out when they can get them, to be in time for the shipments of corn from the Black Sea in September. While a good deal of business is being done for the Mediterranean and Baltic, there is a moderate inquiry for the coast, especially for the small ports on the east coast, where, on account of the labourers being employed on the harvest, small ships are detained a long time before they can be discharged of their cargoes. Freights are without much change.

The relation of the coalowners to the miners with regard to the proposed reduction of wages is attracting a good deal of attention. It is thought that neither the Durham nor Northumberland miners will submit to a reduction of 20 per cent. on their wages, though at the same time it is not believed that there will be a strike. There may be some disturbance in the trade—each party will hold out for its own terms; but it is generally thought that the points in dispute will be compromised, most likely, as previously reported, by a reduction of 10 per cent. upon the present rate of wages.

The iron trade of the North of England continues to show signs of improvement, though, like as has been the case in other businesses in the district, it is merely in degree. But there is an improvement.

The chemical trade of the Tyne was firmer last week. Quotations were better, and there was an increase in the shipment of chemical goods to the Continent, more especially to Stettin and Swinemunde.

The fire-clay and retort trade has been tolerably active. Prices have not changed much during the past four months.

The Weardale and Shildon Water Company are about to greatly extend their operations by taking upon themselves to supply a large number of pit villages from the Waskerley reservoir. This has been long desired in South Durham, and it will be a boon to an extensive mining population, who within a recent period have suffered very much through a bad supply of water.

Register of New Patents.

4178.—SPICER, R. P., Parliament Street, Westminster, "*Improvements in apparatus used in the manufacture of gas.*" Patent dated Dec. 19, 1873.

This invention has reference to the construction of apparatus specially adapted for the manufacture of gas when the decomposition of water is effected for the purpose of supplying hydrogen and other gases, which are subsequently enriched by their admixture with ordinary coal or cannel gas, or the vapour of petroleum or other suitable spirit or material, and consists in arranging within an oven heated by a suitable furnace any convenient number of retorts set vertically, and made by preference somewhat taper, the largest part being near the bottom. To the upper part of the retort a funnel-shaped mouthpiece or hopper is attached by a spigot and socket arrangement, or by means of a flange, to the retort.

Within the hopper, and at any convenient distance from the top thereof, a disc is suspended by means of a rod or chain attached to a lever, which is furnished with a counterbalance weight, and which when at rest keeps the disc in close contact with the lower end of the hopper, and the retort is thus closed, but upon the said disc being depressed the retort will be opened for the admission of coke or other material.

Between the flanges of the retort and the mouthpiece, or otherwise, is inserted a collar or ring furnished with lugs which project inwards, and from which pieces of chain or other suitable iron may be suspended or supported.

The upper part of the oven is formed by two arches, one beneath the other, so as to leave an intervening space, and within this space one, two, or more steam superheaters, consisting of a block or blocks of iron with a number of channels, conduits, or passages are fixed. These superheaters are provided with suitable pipes which communicate with and extend to nearly the bottom of the interior of the vertical retorts. The superheaters have also pipes, which are connected therewith, and to a steam-chest or chamber placed at the top of and exterior to the retort-bench. At one side or end, or in any convenient position, is erected an ordinary steam boiler for the supply of steam to the steam-chest before alluded to.

Fig. 1 represents a sectional front elevation; Fig. 2, a plan; and Fig. 3, a longitudinal section through A, B, fig. 2. In fig. 1, C is the furnace; D D the retorts, with their mouthpieces, E E, one of which is exhibited more completely in section in order to show the arrangement for the supply of coke and means for closing the retort. It will be observed that the upper part, F, of the mouthpiece, E, is funnel or hopper shaped, and that it is provided with a disc, G, suspended by the rod, H, to the weighted lever, I, which is supported by a standard, J, to the side of the mouthpiece. By pulling upon a chain or rod attached to one end of the lever, I, the disc, G, is depressed, and allows the coke or other matter to fall into the retort. On the release of the rod or chain the disc, G, is raised by the preponderance of the weight at the opposite end of the lever, and thus closes the communication between the hopper and the retort. K is the ring or collar with lugs and hooks or other suitable appendage from which the chains, L L L, or other iron is suspended. M M, are the troughs or vessels supplied with water into which the open ends of the retorts, D D, dip, and are thus sealed. N N is the space between the two arches, O and P, before spoken of, and in it are placed the two steam superheaters, Q Q. R is the steam-boiler (seen only in fig. 2) and from which a pipe S rises and conveys the steam to the steam-chest T. From the upper part of this chest pipes, U U, descend to near the bottom of the steam superheaters, Q Q, and at or near the top of the steam superheaters one end of each of the pipes, W W, is attached, the other end being introduced into the upper part of the retorts, D D. In the retort on the right hand of the drawing the chains are omitted (to save confusion) and the descent of the pipe, W, is shown, the superheated steam being emitted from the bottom of the pipe at the point marked X. The decomposed steam or resultant gases are taken off near the top of each retort by the pipes, Y Y, fig. 2, and are conveyed by them to the condensers, Z Z, which consist of a coil of pipes arranged as shown, immersed in troughs of water. From the outlet of the condenser pipes, *a a*, proceed to the washer, *b*.

The action or method of using the apparatus is as follows:—Steam is conveyed from the boiler, R, by the pipe, S, to the steam-chest, T, which is placed in such a position as to attain a high heat. From thence the steam which has been partially dried is conducted by the pipes, U U, to the superheaters, Q Q, through the passages of which it travels and acquires a still higher temperature. The steam so treated is then led by pipes, W W, to the vertical retorts, D D, which have been previously charged through the hoppers, F F, with coke, peat, lignite, or other suitable carbonaceous material and iron and highly heated. The steam thus introduced is carried down by the pipes, W, to near the bottom of each retort, where it escapes at the point, X, and is diffused amongst the incandescent carbonaceous matter and iron. Here the steam in its course through the substances just mentioned is decomposed and converted into hydrogen and other gases, which as they are formed pass off through an outlet in the upper part of the retort, and are conveyed away by the pipes, Y Y, to the condenser, Z, washer *b*, and other suitable apparatus for purification.

The vertical retorts being made open at the bottom, and dipping into the troughs, M M, it follows that the ash resulting from the partial consumption of the coke will fall into these troughs, from whence it may be removed at either side of the bench at pleasure, or whenever necessity may dictate.

FIG. 2.

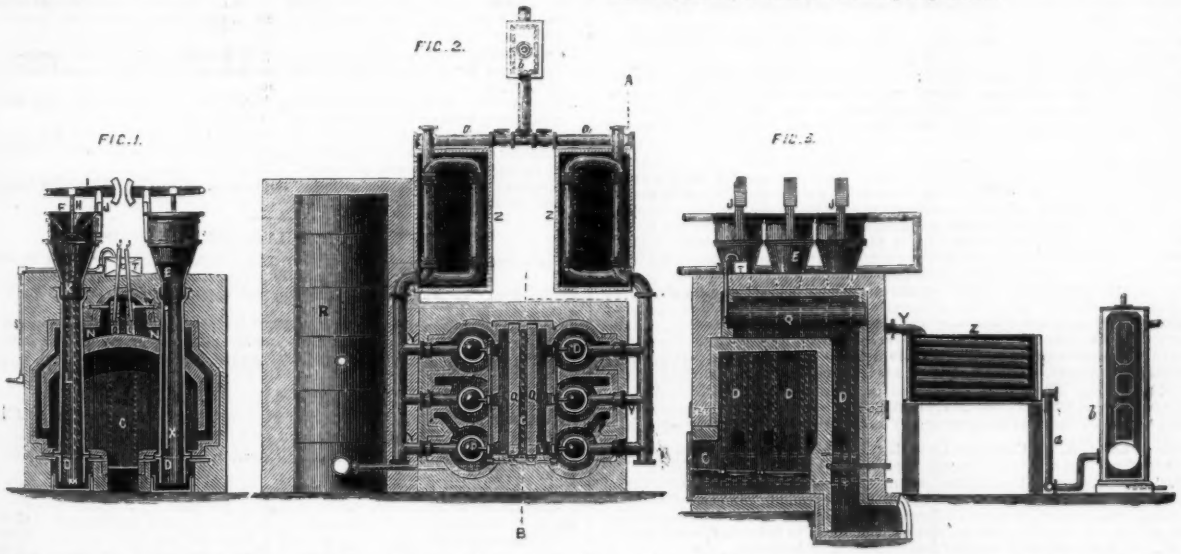


FIG. 1.

FIG. 3.

4202.—AUTIER, C., Paris, "*A new and improved pressure-cock for the passage of gas and fluids, self-shutting or closing at will.*" A communication. Provisional protection only obtained. Dated Dec. 22, 1873.

The invention consists in constructing pressure-cocks self-shutting by connecting together, by means of a straight or bent rod or a simple chain, a piston and a valve upon which the pressure of gas or liquid is unequal, and one opposite to the other.

4229.—JACQUET, F. A., Paris, "*Improvements in portable gas cooking apparatus.*" Patent dated Dec. 24, 1873.

This invention relates to the construction and arrangement of gas-burners for cooking or stove-heating. The burner consists of an annular chamber with jet holes on its interior periphery. Gas and air are supplied to this chamber by a tubular handle, and the mixture issues in jets of flame in the middle of the ring. Above the annular chamber is a deflecting ring, having on its radial ribs to support a pan or other utensil. The in-draught of air deflected by this ring conveys the annulus of flame towards the centre of the utensil, from which it spreads out between the radial ribs. A concave reflector is placed below the burner to reflect heat upwards. Several such burners may be combined in one framing to heat a hot plate or several utensils. Also a burner of this kind may be used in a stove to heat air which passes from a chamber below the burner through a tube carried up through the centre of the burner, and expanding in conical form above it. The burner in this case is enclosed in a casing, whence the products of combustion are conveyed by a pipe to a chimney or other discharge.

4230.—JACQUET. F. A., Paris, "*Improvements in gas heating apparatus.*" Patent dated Dec. 24, 1873.

This invention relates to the arrangement and construction of the air-channels and the passages for the escape of products of combustion from gas stoves of the kind wherein, by means of reflectors, the light of the gas consumed is caused to present the appearance of an open fire.

The gas flame at the upper part of the open front of the stove casing is surmounted by a chamber having in it passages for the products of combustion and also passages for air ascending behind the reflector from a chamber below. These

passages are arranged so as to present a large amount of heating surface while they completely separate the products of combustion on their way to the chimney from the air heated by them in its passage to perforations by which it issues at the upper part of the stove.

4264.—DEACON, G. F., Liverpool, "*Improvements in apparatus for indicating the velocity or measuring the flow of water in pipes.*" Patent dated Dec. 29, 1873.

This invention relates to improvements upon a former patent of the present inventor (see JOURNAL OF GAS LIGHTING, vol. xxiii., page 53), March 14, 1873, No. 937.

According to the former invention a ball, disc, or other object, which was placed in and made partly to fill the pipe used for supplying or conveying water, was acted upon by the pressure due to the velocity of the water, and in its turn acted upon a weight or spring, the leverage or amount of which increased as the ball or disc was moved in the direction of the flow until at some point it balanced the pressure due to that velocity. By this means the apparatus was made to indicate by the position of any parts connected with the ball or disc the velocity of the water at any instant.

The first part of the present invention provides means for increasing the sensitiveness of the indicating or measuring instrument at low velocities.

Instead of so arranging the apparatus that the moving parts are intended to be in a state of exact balance when the indicating instrument points to zero (at which time the water is motionless, a condition the attainment of which is often attended with much difficulty, because friction prevents the moving parts from working uniformly with the requisite quickness and nicety), and from reaching the exact point with a given velocity of flow, at which they would otherwise stand, there is placed within the pipe a ball, disc, or other object having a diameter equal in size to that of a portion of the pipe, so as to fit it exactly when the indicating instrument is at zero. The pipe is not of uniform diameter throughout, but increases from the point where the ball or disc fits it until it becomes of such a diameter at the point where the disc or ball stands when the maximum flow takes place that a sufficient annular space is left for the passage of the water. In connexion with a variable weight or spring there is employed a constant weight, which has the effect of drawing the ball or disc to the zero point, but which, as at that point there is no waterway, will nevertheless move with the slightest pressure due to a flow of water; and by changing the absolute or relative amounts of the variable weight or spring and the constant weight, various degrees of motion for different increments of velocity can be obtained.

The second part of the invention relates to the use of a constant weight, only without a varying weight. By the use of a pipe with an increasing diameter (such as before mentioned) an increased flow of water will force the disc or ball in the direction of the flow till the increased annular space surrounding the disc or ball gives sufficient outlet for such increased flow.

It is obvious that the disc or ball when used as proposed with such a pipe, though it be only balanced by a constant weight, will have a particular position for every particular velocity, depending upon the area of the annular space surrounding the disc or ball; and the increase of the annular space may, if desired, be so proportioned from *nil* at zero to a maximum area at the point of maximum velocity, that the constant weight will be drawn through nearly equal spaces for equal increments of velocity.

The third part of the invention provides means for obviating the difficulty arising from the friction which is inseparable from the use of a stuffing-box of the ordinary construction. The stuffing-box is dispensed with, and instead of employing packing of any kind, the wire connecting the disc or ball with the moving parts outside the pipe is caused to pass through a hole in the metal-work, which it fits as accurately as possible, consistent with its freedom, and the small quantity of water which oozes past the wire is allowed to drain away.

4273.—LOGAN, A. W. A., Rochdale, "*Improved apparatus for cleaning pipes or tubes.*" Provisional protection only obtained. Dated Dec. 30, 1873.

This invention is designed principally for the purpose of cleaning out the fire-tubes of locomotive or other multitubular boilers; but it is also applicable for cleaning out tubes or pipes of various dimensions used for the conveyance of water or gas, or for other similar purposes. The invention consists of an expanding scraper formed of three, four, or more scrapers of a segmental shape, hinged to a boss screwed or fixed on one end of a rod, and kept expanded by means of springs.

4285.—BECKETT, W. H., Chelmsford, "*Improvements in the construction of valves.*" Patent dated Dec. 31, 1873.

This invention consists in applying dics or plates as valves for opening and closing the apertures or passages through which fluids or liquids are to pass, the peripheries of the same being provided with cogs or teeth, and the backs or inner surfaces having spindles furnished with screw-threads thereon, which project from their centres. The cogs or teeth on the dics or plates gear into racks formed or fitted on the opposite sides of the shell of the valve. A tube or barrel having a screw-thread on the interior thereof is provided, and a smaller cross-tube or barrel placed at right angles, the same being also provided with screw-threads corresponding with the threads on the spindles. Upon the last-mentioned tube or barrel wings or flanges are formed, which slide in grooves formed in or fitted upon the sides of the shell of the valve. A rod or spindle, with its lower end provided with a screw thread gearing into the screw thread on the inner part of the tube or barrel, is provided and fitted into the shell of the valve. To work the valve, the screw threads of the spindles on the back or inner surfaces of the discs or plates are screwed into the tube or barrel before described. The rod or spindle by which the several parts of the valve are actuated is also inserted therein, and the parts placed into the body or shell of the valve. Upon turning the rod or spindle the tube or barrel unthreads and travels downwards, and the cogged peripheries of the discs or plates come into gear with the racks, one turning to the right and the other to the left. The same motion causes the screwed spindles on the back of the discs or plates to unthread and move laterally, and when opposite the seating of the valve to close it, the same being opened by a reverse motion of the rod or spindle.

4294.—CLARK, A. M., Chancery Lane, London, "*Improvements in the manufacture of gas and fuel.*" A communication. Patent dated Dec. 31, 1873.

This invention relates to a method or methods of effecting the reduction of mineral or vegetable hydrocarbons by causing the same to be absorbed and subdivided by coke or other porous substance in order to obtain a rich illuminating gas, and at the same time of converting the small or coke dust, when such is used, into a merchantable coke of a very high calorific power.

In some gas-works it has been found necessary, in order to obtain a rich gas, to have recourse to a mixture of from 10 to 15 per cent. of Boghead or other cannel, but the gas produced is found to contain an excess of carbon, which renders the flame fuliginous, and the pipes become obstructed by the quantity of tar deposited. The mixture further leaves a residue of silica and alumina, from which the coke must be freed. Moreover the cost of the gas is high, owing to the expense of the Boghead.

The various apparatus which have been contrived for the manufacture of rich gas from hydrocarbon oils have failed to completely reduce and divide these hydrocarbons so as to produce a rich illuminating gas available commercially.

According to this invention these difficulties are overcome by taking advantage of the porous nature of coke, which is dried sufficiently to enable it to absorb, at a proper temperature, from 20 to 25 per cent. of a hydrocarbon capable of producing a rich permanent bicarburetted hydrogen gas $C_4 H_4$. From the coke thus prepared is obtained, in the ordinary apparatus now used in gas-works, a rich gas, either by using the coke thus saturated with hydrocarbon alone or mixed with coal, according as it is desired to produce a rich gas, or a mixed gas, or to enrich ordinary coal gas.

It is also proposed to utilize in the same way the small and dust of the coke in order to produce a rich or mixed gas, and at the same time to reconvert the small or dust into a merchantable coke. This is effected by agglomerating the small and dust of coke with a mixture of pitch and resin, and moulding into blocks like the "briquettes" used for fuel. These briquettes are then caused to absorb 20 or 25 per cent. of a hydrocarbon capable of producing a rich gas; or instead of moulding the small coke or dust into briquettes, it is first caused to absorb 20 to 25 per cent. of hydrocarbon, and it is then agglomerated with the mixture of pitch and resin, leaving it to be employed in bulk like coal to produce a rich gas and a marketable coke as in the former case.

APPLICATIONS FOR LETTERS PATENT.

2815.—SMITH, W. H., Edgbaston, Birmingham, "Improvements in treating metals and their alloys by subjecting them to the action of liquids, gases, vapours, and in apparatus employed therein, and for the manufacture of gas for illuminating and heating purposes." Aug. 15, 1874.

2821.—BAGGS, I., High Holborn, London, "Improvements in the manufacture of light gases, and in the method of inflating balloons therewith (for military and other purposes), and in machinery and apparatus for such purposes, and for directing, guiding, propelling, and managing such balloons." Aug. 15, 1874.

2822.—FORBES, Rev. G. H., Broughton, Northampton, "Improvements in the manufacture of cement." Aug. 15, 1874.

2824.—JOHNSON, S. H., F.C.S., Stratford, Essex, "Improvements in cocks or valves." Aug. 15, 1874.

2841.—LALANDE, F. DE, Paris, "Improvements in the treatment of alizarine for the production of different colours or hues therefrom in dyeing and printing." Aug. 18, 1874.

2847.—RUSS, B., Little Ilford, Essex, "Improvements in the manufacture of gas and in the apparatus connected therewith." Aug. 18, 1874.

2850.—LÜDEKE, J. E. F., Camden Town, London, "Improvements in machinery or apparatus for obtaining and applying motive power, and in turbines and pumps applicable thereto; parts of which improvements are applicable to raising water and other liquids or fluids, and to other useful purposes." Aug. 19, 1874.

GRANT OF PROVISIONAL PROTECTION.

2742.—PAYTON, W., Shelgate Road, Surrey, "Improvements in valves for controlling the delivery of water or other liquids from or into pipes, cisterns, tanks, or other vessels or apparatus." Aug. 7, 1874.

NOTICES TO PROCEED.

1175.—PEARSON, E., Old Kent Road, London, "Improvements in water-closets and in taps for the same, also applicable to other purposes." April 4, 1874.

1176.—PEARSON, E., Old Kent Road, London, "Improvements in taps, cocks, or valves for adjusting or regulating the flow of liquids and gaseous fluids." April 4, 1874.

1215.—RONALD, B., and FARMER, J., Glasgow, "Improvements in the modes of and apparatus for regulating the supply of water to water-closets and other vessels." April 8, 1874.

1256.—SUFFIELD, T., Bermondsey, London, "Improvements in pumps, chiefly intended for acids and other corrosive liquids." April 11, 1874.

1269.—AUERBACH, G., and GESSERT, T., Elberfeld, Germany, "Improvements in manufacturing alizarine and isopurpurin out of anthracene." April 13, 1874.

2567.—WILLETT, G., HARRIS, R. J., and LUND, J., Worthing, "Improvements in filtering sewage, and in the means for effecting the same." July 22, 1874.

2692.—RIGBY, J., and RIGBY, J., Manchester, "Improved apparatus for lighting and ventilating." Aug. 4, 1874.

PATENTS WHICH HAVE PASSED THE GREAT SEAL.

702.—WESTON, J. H., Lansdowne Road, Surrey, "Improved means of and apparatus for purifying, carburetting, and increasing the illuminating power of coal gas." Feb. 24, 1874.

733.—SOMERVILLE, J., Dublin, "Improvements in the method of manufacturing gas for lighting and heating, and for the apparatus used therein." Feb. 27, 1874.

734.—HUGHES, N. H., Ashgrove House, Ayr, N.B., "A new or improved self-registering fluid or liquid measurer." Feb. 27, 1874.

810.—WESTON, J. H., Lansdowne Road, Surrey, "Improved means and apparatus for increasing the illuminating power of gas in lamps and other mediums of lighting, portable and otherwise." March 5, 1874.

934.—HILLS, F. C., Deptford, Kent, "Improvements in the purification of gas and gas liquor." March 14, 1874.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £50 BEFORE THE EXPIRATION OF THE THIRD YEAR.

2135.—ROBERTS, T., "Improvements in and apparatus for filtering liquids." Aug. 14, 1871.

2139.—BALME, A., and CROSSLEY, A. B., "An improved machine or apparatus for punching, shearing, and cutting plates for ships, boilers, gasometers, water-tanks, and similar vessels or articles." Aug. 15, 1871.

PATENTS WHICH HAVE BECOME VOID

BY REASON OF THE NON-PAYMENT OF THE ADDITIONAL STAMP DUTY OF £100 BEFORE THE EXPIRATION OF THE SEVENTH YEAR.

1992.—M'GEORGE, I. M., and PAUL, A., "A new or improved plug-valve." July 8, 1867.

2253.—DINSDALE, G. W., "Improvements in the construction and manufacture of traps for water-closets, drains, and other purposes." Aug. 3, 1867.

2314—M'DOUGALL, A., "Improvements in the extraction and separation of the sulphur contained in products resulting from the alternate exposure of certain metallic oxides to gases containing sulphuretted hydrogen, and to oxygen." Aug. 12, 1867.

Notes and Queries.

S. E. asks if there are any means of heating furnaces for glass-melting by gas, and what those means used are.

W. X. W.—The proceeding was clearly illegal, unless special notice had been given.

G. B. H.—The difference is nearly two candles in favour of the "London" burner. Every company for whom a 15-hole Argand has been prescribed may legally employ the 15-hole "London" burner, which gives as good results as the burner authorized by the referees.

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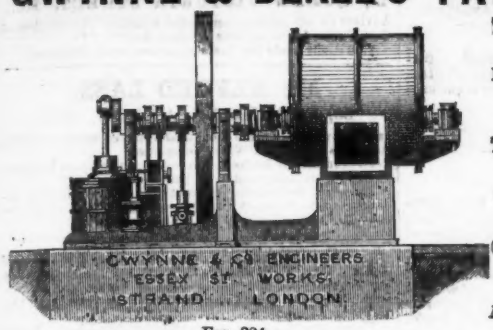

FIG. 224.

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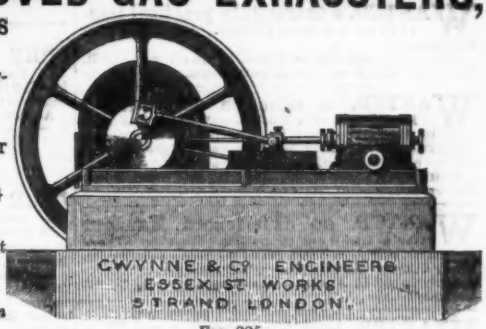

FIG. 225.

Fig. 224 represents one of those erected at the Imperial Gas-Works, Bromley, capable of passing 210,000 cubic feet of gas per hour. Several others of the same size are now on order for the same Company. These Patent Machines combine the highest quality of workmanship and materials, the largest bearings and wearing surfaces, with the **most perfect system of action yet discovered.** Fig. 225 represents one of a series of four at the Nottingham Gas-Works, each passing 62,500 cubic feet per hour. GWYNNE AND Co. *do not pretend to enter into a struggle with other makers in respect to cheapness. They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality, and the most approved design and arrangement.* Their prices have been estimated with a due regard to the **excellence of the article produced,** and when this is taken into consideration, they have no fear for the result. The orders executed this season for Exhausters and alterations to their patented system amount to over 4,000,000 cubic feet of gas passed per hour, and to over 300 horse power for Engines to drive them. In every instance their work is giving the greatest satisfaction. Numerous testimonials and references can be given.

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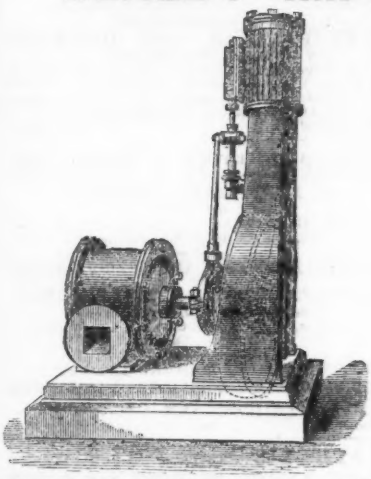
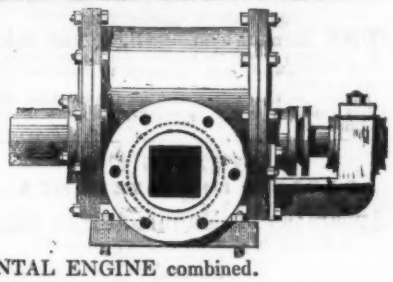


WITH

ENGINE COMBINED

ON

ONE BASE PLATE.



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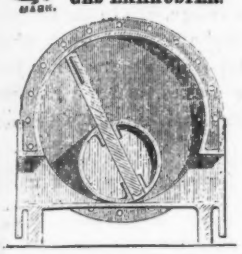

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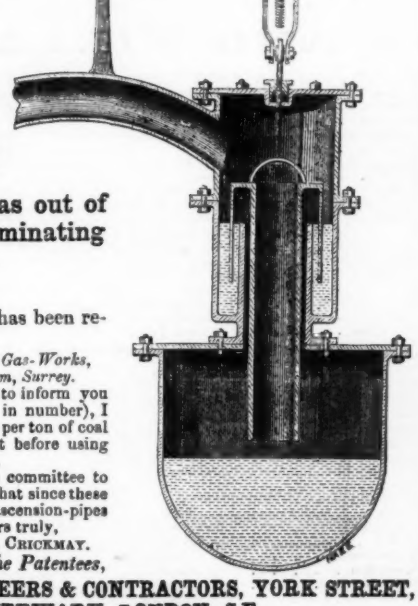
1st, There is no pressure on the Retorts.
2nd, No deposit of Carbon.
3rd, No scurfing required.
4th, Never a choked Ascension Pipe.
5th, Saves Fuel and Wear and Tear.
6th, Gets 10 per cent. more Gas out of the Coal, and a higher Illuminating Power.
7th, Is never out of order.



The following (among other letters) has been received:—

Engineer's Office, Metropolitan District Asylum Gas-Works, Caterham, Surrey.

Messrs. Chandler and Sons.

Dear Sirs,—In reply to your inquiries, I beg to inform you that since I have used your Patented Dips (ten in number), I find my make has increased over 1000 cubic feet per ton of coal carbonized, my usual make being 9070 cubic feet before using your Dips, and 10,150 cubic feet since using them.

I should add that I intend recommending the committee to adopt them throughout these works. I also find that since these Dip-Pipes have been fitted, I have had no ascension-pipes choked, which was before a great nuisance.—Yours truly,

Jan. 15, 1874. WM. CRICKMAY.

For terms of use and cost, apply only to the Patentees,

Messrs. CHANDLER & SONS, ENGINEERS & CONTRACTORS, YORK STREET, LONDON ROAD, SOUTHWARK, LONDON, S.E.

CATHELS'S Patent District Dry Gas-GOVERNOR is the only perfect self-acting contrivance for Regulating the Pressures in the higher levels of a district.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, ROTHERHAM.

CATHELS & TERRACE'S Patent Four-WAY DISC GAS-VALVE is the simplest and best Valve for Purifiers, and as a By-pass for other apparatus in Gas-Works. It is always gas-tight, and has no springs, ground faces, or other delicate parts. By its use the flow of the gas cannot be accidentally stopped, and it never sticks.

For prices, &c., apply to the Manufacturers, Messrs. GUEST AND CHRIMES, Foundry and Brass Works, ROTHERHAM.

BIRTLEY IRON WORKS,

CHESTER-LE-STREET, DURHAM.

Manufactory for every description of Casting and Machinery for Gas-Works and Water-Works.

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Agent in London, Mr. J. MANWARING, 101 Cannon Street E.C.

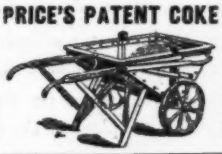
THOMAS CARR & SON,

MANUFACTURERS OF

FIRE-BRICKS, LUMPS, TILES, RETORTS, &c., &c.,

SCOTSWOOD FIRE-BRICK WORKS, NEAR BLAYDON-ON-TYNE.

PRICE'S PATENT COKE & COAL BARROW.



effecting a great saving of time, labour, and expense.

For particulars, price, &c., apply to Mr. E. PRICE, Inventor and Patentee, Gas-Works, Hampton Wick, MIDDLESEX.

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N.B.—Above works having been recently enlarged, orders of any magnitude for HOME or EXPORT Trade will receive immediate attention.

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THE ORIGINAL MANUFACTURER OF

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GAS PURIFIERS & SCRUBBERS.

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These Sieves are made with parallel or bevel bar, and guaranteed to be well seasoned yellow deal, and not common spruce so generally used.

N.B.—Specimens sent free on application.

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WOOD SIEVES,

WITH TAPER BARS,

MADE BY MACHINERY

CAPABLE OF MAKING 10,000 FEET WEEKLY.

References to Hundreds of First-Class Engineers.

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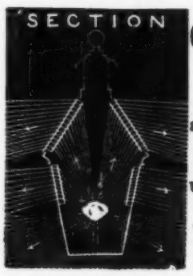

THE PATENT

CATOPTRIC LAMP

Is now in use in Moorgate Street, Cheapside, and Trafalgar Square, and has been in successful operation upon Waterloo Bridge since Oct. 7, 1871.

T. A. SKELTON, 37, Essex St., Strand, LONDON, INVENTOR AND PATENTEE.

GEORGE BOWER,

GAS & WATER-WORK ENGINEER & CONTRACTOR,

ST. NEOTS,

HUNTINGDONSHIRE.

The selected list of Gas and Water Works herewith given, is exclusive of a great number either erected complete, or the plant supplied to Agents and Engineers, the destinations of which it would not be proper to give, and of minor alterations and additions to existing works.

It will be observed that the list includes works supplied for the largest city as well as the smallest village, and to the British, the French, the Japanese, and the Italian Governments, the Shah of Persia, H.H. the Viceroy of Egypt, and a vast number of other persons of distinction. Gas-works have been sent to all quarters of the globe, and for making Gas from almost every material which will burn with a flame in open air; coal, lignite, wood, peat, bones, resins, the refuse of the olive presses, and the carcases of animals, are among the solids which have been used in one locality or another. Resin-oil, tallow, petroleum, paraffin oil, refuse of the oil distilleries, and other oils, are among the fats and liquids which have been used.

For the Indian Government, a complete plant from the retorts to the burners has been supplied, for making gas for many thousands of lights from crude mineral oil of the country.

The Engineering Works are at St. Neots, and the Foundry at West Hartlepool; and EVERYTHING connected with gas lighting is manufactured at either one place or the other.

Mr. Bower desires to draw attention to many parts of gas apparatus which have originated with him, and which he believes not to be without merit; the following are some of them:—The Combined Purifying Apparatus, patented in 1852 and 1863; the Rising Plug-Valve, with special adaptation for working any number of Purifiers; By-pass and Four-way Valves, Engines and Exhausters on one bed-plate, Street Lanterns without bars at the side to intercept the light, and many other apparatus which may be found in his "Gas Engineer's Book of Reference."

For small Gas Apparatus, specially designed for private consumers, either Mr. Bower or his Licensees or Agents have obtained a large number of medals at the various exhibitions in this and other countries.

As an engineer, Mr. Bower will design and carry out Gas or Water Works on Commission; or, as a Contractor, he will carry them out at a lump sum, inclusive or exclusive of buildings.

A SELECTION OF GAS AND WATER WORKS

DESIGNED, AND (WITH SCARCELY AN EXCEPTION) ERECTED, BY

GEORGE BOWER,

ENGINEER & GAS-WORK CONTRACTOR,

ST. NEOTS, HUNTINGDONSHIRE.

TOWNS AND VILLAGES.

Almwch	Isle of Anglesea
Ampthill	Bedfordshire
Barkway	Hertfordshire
Barrow	Lincolnshire
Beaufort	Breconshire
Belgrano	Argentine Confederation
Billingborough	Lincolnshire
Bishop's Castle	Shropshire
Bolsover	Derbyshire
Bourne	Lincolnshire
Buckfastleigh	Devonshire
Buenos Ayres	Two Works, one for the Argentine Gas Co., the other for the Mutual Consumers Gas Co.
Burford	Oxfordshire
Caerleon	Monmouthshire
Caistor	Lincolnshire
Casale	Italy
Charing	Kent
Chertsey	Surrey
Childwall	Lancashire
Chimay	Belgium
Cleethorpes	Lincolnshire
Christchurch	New Zealand
Coalville	Leicestershire
Collingham	Nottinghamshire
Colombo	Ceylon
Cottingham	Yorkshire
Crickhowel	Breconshire
Dokkum	The Netherlands
Donnington	Lincolnshire
Dragten	The Netherlands
Easton	Northamptonshire
Ebbw Vale	Monmouthshire
Eu	France
Evesham	Worcestershire
Folkingham	Lincolnshire
Gefle	Sweden
Harlingen	The Netherlands
Hatfield	Hertfordshire
Haverhill	Suffolk
Higham Ferrers	Northamptonshire
Hirwain	Glamorganshire
Horbling	Lincolnshire
Irthlingborough	Northamptonshire
Kelvedon	Essex
Kempstone	Bedfordshire
Ketton	Rutland
Kimbolton	Huntingdonshire
King's Cliffe	Northamptonshire
Kirton-in-Lindsey	Lincolnshire
Llandilo-vawr	Carmarthenshire
Llantrissant	Glamorganshire
Littlehampton	Sussex
Littleport	Cambridgeshire
Looe	Cornwall
March (*remodelled*)	Cambridgeshire
Middleham	Yorkshire
Milverton	Somerset
Minehead	Somerset
Mountsorrell	Leicestershire
Navenby	Lincolnshire
Nayland	Suffolk
Nettlebed	Oxfordshire
Newport	Essex
Oakham	Rutland
Olinda	Brazil
Pangbourne	Berkshire
Patrington	Yorkshire
Pelotas	Brazil
Porto Alegre	Brazil
Ponce	Porto Rico
Port Elizabeth	Natal
Potton	Bedfordshire
Purmerende	The Netherlands
Quorndon	Leicestershire
Raunds	Northampstonshire
Redbourne	Hertfordshire
Red Hill	Surrey
Repton	Derbyshire
Rhyader	Radnorshire
Rio Grande do Sul	Brazil
Risca and Pontymister	Monmouthshire
Rockingham	Northamptonshire
Roux	Belgium
Saffron Walden	Essex
Sandy	Bedfordshire
San Sebastian	Spain
Schagen	Holland
Shanklin	Isle of Wight
Skibbereen	Ireland
Somerby	Leicestershire
Spa	Belgium
St. Blazey	Cornwall
St. Ives	Hunts (*remodelled*)
St. Ives	Cornwall (*remodelled*)
St. Neots	Hunts (*remodelled*)
St. Heliers	Jersey (*Water-Works*)
Stevenage	Hertfordshire
Sudbury	Suffolk (*Water-Works*)
Sutton Valance	Kent
Syston	Leicestershire
Swineshead	Lincolnshire
Thorney	Cambridgeshire
Tunis, City of	Tunis
Turvey	Bedfordshire
Tver	Russia (*Gas and Water Works and Public Baths*)
Vitoria	Spain
Voronege	Russia (*Water-Works*)
Wainfleet	Lincolnshire
Waterbeach	Cambridgeshire
Wellingborough	Northamptonshire (*remodelled*)
Wellingore	Lincolnshire
West Houghton	Lancashire
Whittlesea	Cambridgeshire (*remodelled*)
Whitwick	Leicestershire
Wigston	Leicestershire
Wincanton	Somersetshire

A SELECTION OF GAS AND WATER WORKS

DESIGNED, AND (WITH SCARCELY AN EXCEPTION) ERECTED, BY

GEORGE BOWER,

ENGINEER & GAS-WORK CONTRACTOR, ST. NEOTS, HUNTINGDONSHIRE.

Palaces and Mansions, Factories, Railway and Military Stations. Mills, Collieries, Iron-Works, Prisons, Hospitals, Government and other Establishments.

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His Highness the Viceroy of Egypt	Alexandria
His Highness the Prince Putbus of Putbus	Isle of Rügen, Prussia
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His Grace the Duke of Buckingham and Chandos.	Stowe Palace, Buckingham [ford
His Grace the Duke of Grafton	Wakefield Lodge, near Stoney Strat-
His Grace the Duke of Marlborough	Blenheim Palace, Woodstock
His Grace the Duke of Newcastle	Clumber Park, Worksop
Her Grace the Dowager Duchess of Northumberland	Stanwick Hall, Darlington
The Most Hon. the Marquis of Downshire	Easthampstead Park, Wokingham
The Most Hon. the Marquis of Exeter	Burghley House, Stamford
The Most Hon. the Marquis of Salisbury	Childwall, near Liverpool
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Fletcher, Sir Henry	Ham Place, Arnold, Sussex
Forsyth, Mrs.	Glengorm, Tobermory, N.B.
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Forthergill, R., Esq.	Abernant House, Aberdare
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Holland, W., Esq.	Maenturog, Caernarvon
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Seager, J., Esq.	Constantinople
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Vansittart, S. H., Esq.	Bisham Abbey, Maidenhead
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Ditto	Military Station	Rawul Pindee, India
Ditto	Ditto	Allahabad, India
Ditto	Ditto	Fort St. George, Madras, India (*remodelled*)
French Government	Tunnel under Mont Cenis	France
Italian Government	Ditto	Italy
Ditto	Six Railway Stations	Italy
Japanese Government	Mining Department.	
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Barrow, R., Esq.	Three Coal Pits	Staveley
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Benoit, Frères	——	Poulignac Croisie, France
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Ditto	Ditto	Eston, near Stockton
Bellefroid, M.	Iron-Works	Liege, Belgium
Billing and Son	Paper Mills	Newport, Salop
Blount and Company	——	Paris
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Brown, B., Esq.,	Paper Mills	Tonbridge
Brown, Sir John and Co., Limited	——	Sheffield
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Great Northern Railway Company	Ditto	St. Neots
Ditto ditto	Ditto	Essendine
Great Eastern Railway Company	Ditto	Audley End
Ditto ditto	Ditto	Low Leyton
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Harle and Son	For Export	Newcastle
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Hill and Butt	Iron Works	Oakfield, near Newport
Howard, Henry, Esq.	Tube Works	Old Hill, Dudley
Hughes, H., Esq.	Engine Works	Loughboroug
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Liboutin, D., M.	——	Roubaix, France
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Mason and Elkington	Copper-Works	Pembrey, Llanelly
Matthews and Company	——	Valencia, Spain
Menaieff and Company	Cotton Mills	St. Petersburg
Metallic Works Company	——	St. Petersburg
Middlesex Magistrates	Industrial School	Feltham
Midland Railway Company	Railway Station	Wellingborough
Ditto ditto	Ditto	Toton
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Monasterio de Nostra Signora	Convent	Bilbao, Spain
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Muller and Linck	——	Stuttgardt, Wurtemberg
National Silk Spinning Company	——	Novaro, Italy
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New Passage Hotel Company	Hotel	Near Bristol
Ogrean, M.	——	Nantes
Palmer's Iron and Shipbuilding Company	[Works Iron & Shipbuilding	Jarrow, near Newcastle-on-Tyne
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Parker, J. E.	For Chassepôt Fctry.	Placencia, Spain
Partridge and Jones	Colliery	Varteg, Monmouthshire
Petchell and Company	For Export	Middlesborough-on-Tees
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Pontypool Iron Company	Iron-Works	Pontypool
Poolman, J., Esq.	Sugar-Works	Melbourne, Australia
Porter, J. T. B., and Company	A large number of Works, both complete and in parts.	Lincoln
Porter, James, Esq.	——	Pekin
Poteloff, N. P., Esq.	Iron-Works	St. Petersburg
Potter, Addison, Esq.	Fire-Brick Works	Willington Quay, near Newcastle-on-Tyne
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Rignon and Company	——	Savigliano, Italy
Roca, Don José	——	Barcelona, Spain
Royal School of Mines	——	Stuttgardt, Wurtemberg
Rosser, Thomas	Several Works	Nantes, France
Robins	Cement Works	Northfleet
Russell, J., and Sons	For Export	Wednesbury
Russian Spinning Company	——	St. Petersburg
Sampson Cotton Spinning Company	——	St. Petersburg
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Shangshieff, M., Esq.	——	St. Petersburg
Schipoff and Company	——	Moscow
Shropshire Union Rail. & Canal Co.	Ellesmere Port	Cheshire
Shute, Thomas, Esq.	Silk Mills	Watford
Smith and Sons	Paper Mills	Watford
Smith, G. L., Birmingham	Chassepôt Rifle Fcty.	Spain
Smith, M.	——	Yokohama, Japan
Stephens, G., Esq.	Courier Office	Brisbane, Australia
Stears, T. W., and Company	Several Works	Hull
Sydney Sugar Company	——	Sydney, Australia
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Tidcombe and Son	For Export	Watford
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Tzarskoe-Celo Railway Company	Ditto	St. Petersburg
Vandenberg and Company	——	Amsterdam
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Vassier and Company	Marnay par Azay le Rideau, Indrect Loire	France
Victoria Sugar Company	——	Melbourne, Australia
Vipond and Company	Colliery	Varteg Hill, nr. Pontypool
Wagenmann and Seybell	——	Vienna
Whalley and Hardman	Cotton Mills	Kirkham, near Preston
West and Son	Iron Works	St. Blazey, Cornwall
Whitehouse, David, Esq.	Iron and Tin Works	Abercarne, Monmouthshire
Williams and Company	Tin Works	Aberdulais, Neath
Ybarra and Company	Iron Works	Bilbao, Spain
Zyphen and Company	Engineering Factory	Cologne

GEORGE BOWER, ST. NEOTS, HUNTINGDONSHIRE.

THOMAS ALLAN & SONS, of Springbank Iron-Works, Glasgow, manufacture small cast-iron GAS AND WATER PIPES, 1½ to 6 inches, at their branch works, Stockton-on-Tees, and have at present a large stock, which they are open to sell at moderate prices

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Warranted the best quality.
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THOMAS LAMBERT & SONS
MANUFACTURE EVERY DESCRIPTION OF
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INTERNATIONAL EXHIBITION, 1862.
CLASS X.
PRIZE MEDAL
For excellence of Fire-Clay Gas Retorts, and
"HONOURABLE MENTION" for
good quality of Fire-Bricks.
WILLIAM STEPHENSON & SONS,
THROCKLEY,
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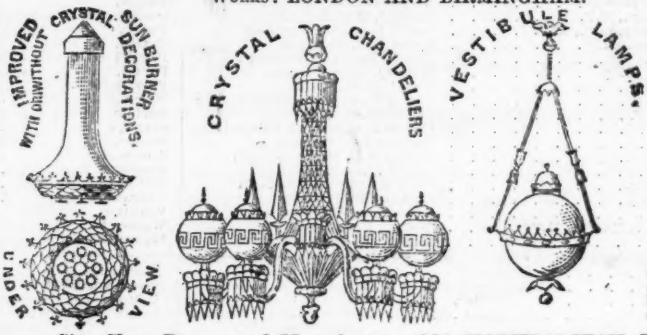

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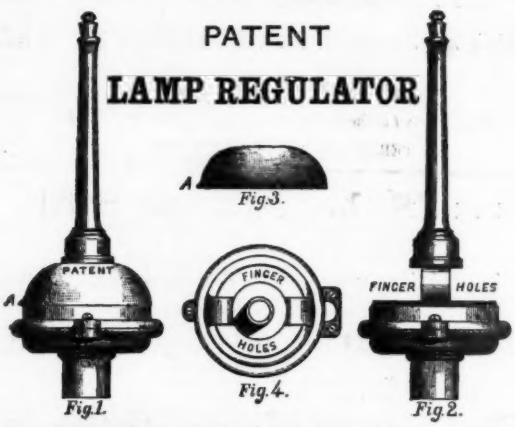

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PATENTEES OF
GAS REGULATORS FOR PUBLIC LAMPS, FACTORIES, PUBLIC HALLS, AND DWELLING-HOUSES.

Attention is respectfully requested to the following extract from a lecture "On the Economical Combustion of Coal Gas," delivered to the Philosophical Society of Glasgow, by Dr. W. Wallace, F.R.S.E., F.C.S., Gas Examiner for the city of Glasgow, on the 4th of March last:—

"A few years ago, a simple form of Gas Regulator for Street Lamps was introduced, I do not know by whom, and various forms of it, and improvements on it, have been made by many practical gas engineers. Of all the modifications of the instrument, the best in my opinion is that of Mr. D. Bruce Peebles, of Edinburgh; in fact, his Lamp Regulators are so superior that they are likely to supplant all others. Already about 9000 of these have been applied to the street-lamps in Glasgow, and I understand it is the intention of the authorities to introduce them all over the town. The saving thereby effected I calculate to be about £6000 per annum, without any diminution of light. One of the great advantages of Mr. Peebles's apparatus over all others is that it can be regulated while the gas is burning."

Since the above date, another 1000 have been supplied to Glasgow, and they are being largely adopted at home and abroad.

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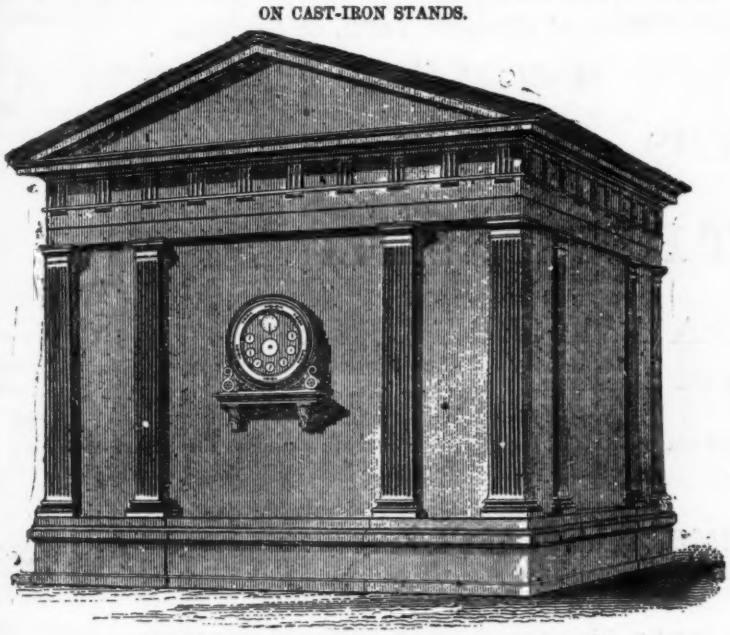

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RETORT SETTINGS, heated by tar without the production of smoke.

STEAM-ENGINES and EXHAUSTERS, separately or combined.

FOUR-WAY VALVES, one of which is equal to three ordinary Valves.

STATION GOVERNORS—the Gasholder cannot tilt and cause accident.

BREEZE AND TAR FUEL MACHINE.

A Pamphlet containing Eighteen Illustrations of the foregoing, with letterpress on the construction of Works, post free, 2s. 6d.

N.B.—The second edition of this Work, *now ready*, contains Illustrations of the Machine for converting Breeze and Tar into Fuel for heating the Retorts.

"The Author is well qualified to speak authoritatively upon the important subjects to which his pamphlet refers."—*Artisan.*

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One ton yields 12½ cwt. of good coke. This Coal can be shipped from Hull, Goole, Liverpool, Morecambe, and Barrow.

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This Coal bears a close resemblance to the Lesmahago seam. It has a first-class Coke, equal to the Lesmahago, and greater in quantity, and 10,538 Cubic Feet of 33·2 Candle Gas.

For rail in Scotland, or shipped at Glasgow, Leith, or Granton.

ANALYSIS AND REPORT
ON
CLIMPY TRIPPING COAL,
FOR GAS PURPOSES.

The results of this analysis, as shown below, were got from actual working, and we have therefore the utmost confidence in placing it, along with that annexed, before you.

COMMERCIAL RESULTS.

Gas per ton of Coal—temperature 60°—barometer 30 inches	10,200 cubic feet.
Coke per ton of Coal	1,400 lbs.
Durability of one cubic foot of the gas, by jet of 5-inch flame	48 min. 24 sec.
Illuminating power in standard candles	14·9

REMARKS.

Being well acquainted with Durham and Northumberland Coals, I have no hesitation in saying that "CLIMPY TRIPPING" is superior to any (containing, besides, a greater proportion of pieces from 7 to 14 lbs. weight), with far less impurities for purification, more gas, and coke equal in calorific power. It has a large mixture of cannel nuts, which accounts for the good quality of the gas, at our photometer in town, 1000 yards from the works.

It is also a very superior Coal for mixing with oils, as by Mackenzie's patent; or with acid tar, or tar oil, shale grease, or other refuse from paraffin-works, as by system of Mr. Scott, of Musselburgh, or Mr. Foster, Portobello, the Coal being easily crushed.

Below are the results realized by myself, when mixed with acid tar from paraffin work, received by me in a solid state, having been run on to very fine dross. My charges were 2 cwt. tripping and 28 lbs. of acid tar, each retort, running six hours; with lighter charges I get more gas, but not so good quality, or so much coke.

Gas per ton of Coal	10,800 cubic feet.
Coke per ton of Coal	1,540 lbs.
Durability of one cubic foot of gas, by jet of 5-inch flame	58 min. 28 sec.
Illuminating power in standard candles	27·29

The first truck received being tried with very light charges (unmixed), and running five hours, I got 10,500 cubic feet of 14-candle gas; and I am confident, practical managers, with good retort-fittings (mine being very inferior), and exhausters at work, as I have seen generally at home and abroad, will take 11,000 feet of 13-candle gas from it. My retorts are 8 feet × 2 feet × 14 inches, D shape, heavy dip, and no exhauster.

These remarks of mine you may perhaps think rather lengthy, but they will be the more intelligible to any manager inquiring for Climpy Tripping.

L. MONK,
Engineer and Manager.

Lanark Gas-Works, April 20, 1874.

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CANNEL FOR GAS-MAKING PURPOSES.

This Cannel produces in actual working, in iron retorts, 9200 cubic feet of 32-candle gas, and upwards of 11 cwt. of coke, and in clay retorts will produce 11,500 cubic feet of 25·9-candle gas.

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MUIRKIRK, No. 1, CANNEL

Yields 11,600 cubic feet of 34·3-candle gas per ton, and 10 cwts. of excellent coke, containing only 5 per cent. of ash.

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Yields 10,700 cubic feet of 32·77-candle gas per ton, and 9½ cwts. of coke, containing 11 per cent. of ash.

OLD WEMYSS CANNEL

Yields 12,550 cubic feet of 33-candle gas per ton.

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STRONGLY RECOMMEND A TRIAL OF THEIR

CELEBRATED SILKSTONE GAS NUTS.

Analysis by F. J. EVANS, Esq., Chartered Gas Company, Horseferry Road, Westminster:—

(COPY.)

	Cubic Feet of Gas per Ton of Coal.	Illuminating Power in Candles.	Coke per Ton of Coal used.	Ash in Coke, per Cent.	Sulphur in Coal, per Cent.
Silkstone Nuts . . .	10·800	15·85	12·66 cwt.....	6·9	0·69

NOTE.—The illuminating power of the gas was tested by the standard burner now used in London by the Gas Referees, under the City of London Gas Act, 1868.

Horseferry Road, Westminster, March, 1870. (Signed) F. J. EVANS.

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COPY TESTIMONIAL.

Northampton Gaslight Company,
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Gentlemen,—We have sold a large number of your Gas Cooking Stoves during the last twelve months, and they have, without exception, given the greatest satisfaction. I consider your Stove the best I have seen.

I remain, yours obediently,
JOHN EUNSON, Jun., Manager.

90, Hatton Garden, London.

London: Printed by WILLIAM BOUGHTON KING (at the office of Clayton and Co., 17, Bouverie Street, Fleet Street); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, August 25, 1874.